THE
SURGICAL CLINICS
OF
NORTH AMERICA

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THE PRESENT MANAGEMENT OF BILIARY TRACT
DISEASE*

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We have had a very strong conviction from our experience with biliary tract surgery based on a considerable number of cases that one of the very important factors that we should all have in mind is that of earlier diagnosis. I feel very sure from our experience that the tendency, particularly on the part of the family physicians who deal with biliary tract disease gallstones and infections is to wait too long for gallstone colic. I think if I can draw upon the comparison of the biliary tract with that of the kidney and prostate I can perhaps more forcibly stress the points which I wish to make regarding earlier diagnosis.

Up to within recent years almost all of us have contemplated the mortality of gallstones and biliary tract infections as largely in the gallbladder when as a matter of actual fact the mortality is in reality in the liver. That compares I think very accurately with the situation which existed in relation to prostates. For a long time we all viewed the mortality of prostates as in the bladder and it took us a long time to realize that the mortality of prostates was in the kidney.

A very similar situation exists in relation to gallstones. We were quite willing to wait with prostates unless we had a prostate which was large enough to completely obstruct before we were

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willing to do prostatectomies Just in a similar manner we are
quite willing I believe to wait until we have gallstone colics
jaundice often biliary tract infection dilatation of the biliary
tree and common duct stones which are associated with these
conditions before we are ready to urge operation That is
quite wrong and results in biliary surgery being done on what
has been called end stage pathology If we are to make early
diagnoses in gallbladders then we must make biliary tract
examinations on less symptomatic evidence than we have been
willing to do up to the present time

This brings us to the point that the reactions to gallstones
to cholecystitis and to biliary tract infection evidence them
selves often atypically Many times I think if one finds gall
stones in the course of a routine examination although that
patient has not had gallstone colic if you go back over the
history you will find digestive disturbances which are doubt
less related to the gallbladder and which will be relieved by
the removal of the gallstones and the removal of the gallbladder
and drainage of the common duct Therefore we would urge
from our experience that all patients with digestive symptoms
without typical gallstone colic be investigated for the possible
presence of gall gallstones and that the fact that they lack
typical pain beneath their right scapula or jaundice should not
lead one to tell these patients because they have gallstones
without very frank evidence of distress in the way of colic that
_____ _____ ____ __ _____ __

are discovered they should be removed and preferably by chole
cystectomy We believe that even though they may not be
producing urgent symptoms at the time of discovery they may
well do so later in life when the patients are less able to with
stand the operation than then they may produce dangerous
symptoms and we believe that often though the symptoms be
not urgent nevertheless they are definitely present as relates
to indefinite digestive irregularities For the type of stone
associated with infection see Fig 179
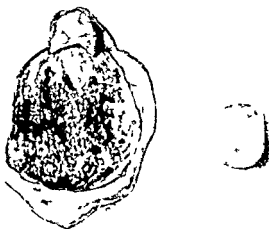
Fig 178 —Cholesterol (strawberry) gallbladder with solitary pure cholesterol stone

Fig 179 —The early calcium laden stone Note the absence of cholesterol and the thick walled gallbladder

The Graham test is the most valuable diagnostic laboratory procedure in gallstone cases This method should be correct in 80 to 90 per cent of the cases but is subject to error One should settle when to give the Graham test intravenously and when to give it by mouth In general the drug by mouth results in fewer serious reactions There are often disagreeable symptoms but these are less serious in the way of collapse by this method than by the intravenous method Our attitude has been that when the Graham test by mouth is uncertain as correlated with the clinical findings it should be repeated intravenously We prefer the intravenous administration because of greater accuracy in our hands but we do not give intravenous Graham tests to patients who have angina pectoris to patients who have any serious cardiac lesions to patients who are badly emaciated or in bad condition nor do we give it to patients who are jaundiced or who have an acute gallbladder I feel quite sure from our experience with the Graham test which now amounts to several thousand tests that the introduction of the dye into the blood stream in the presence of a subacutely infected gall bladder may make it an acute gallbladder requiring immediate operation We feel very sure from an occasional very serious collapse when the intravenous test has been given to patients in bad condition that it is a dangerous method of administering the dye under these conditions

This test is of great value but I would like to say from our experience that it should always be correlated with clinical findings For instance we would not consider operating upon a patient merely because his gallbladder did not fill or empty if he had no clinical evidence of gallbladder disease Likewise we would not hesitate to operate upon a patient for gallstones if he had typical gallstone colic and his gallbladder emptied and filled normally as will occasionally be the case We feel very strongly that when the clinical evidence of gallbladder disease correlates with the x ray findings after the administration of the dye then it becomes of great value and it adds to one's feeling of security in advocating surgery for probable gallbladder pathology (Fig 180)

I would also like to state from our experience that there are several conditions which will interfere with the proper interpretation of the test. For instance, patients who have a duodenal ulcer, particularly during the acute stage of a duodenal ulcer, frequently will not fill their gallbladder, and when they have recovered from the acute stage of the ulcer, their gallblad

Fig 180 — A gallbladder filled by means of the Graham test showing plainly the contrast shadow of contained gallstones

der will fill and empty normally. Pregnant women frequently will not fill their gallbladder with the dye test but will fill it after delivery. Patients with bowel disturbances in the form of the various types of colitis frequently will not fill their gallbladder with the dye test, but when this condition is relieved their gallbladder will fill and empty normally. Therefore, while it is desirable to make early diagnoses and while it is probable

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An additional diagnostic procedure that is little used gener
ally is duodenal drainage There is sufficient reason why this
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Our attitude regarding the management of the patient with
acute cholecystitis is somewhat similar to the management of
the patient with acute appendicitis The difference is that the
appendix is a free organ floating in the peritoneal cavity sur
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cholecystitis, we feel so strongly opposed to radical removals of the gallbladder at this time that we frequently do a preliminary cholecystostomy and perform cholecystectomy on the patient at a later date. For that reason, we have sought, if possible, to save the patient two operations by tiding him through the acute cholecystitis if the progress of the case is satisfactory, until the

Fig 181—Cholesterin crystals and calcium bilirubin pigment from bile obtained by duodenal drainage in a case of cholelithiasis. This finding is pathognomonic of stones in the biliary tract. Other findings may be masses of pus cells, clumps of bacteria or clumps of bile stained columnar epithelium. These are not significant of stone pointing only to more or less severe infection of the biliary tract. Failure to find crystals and pigment does not rule out stone

time when complete removal of the gallbladder can be safely done.

What are the indications then in our mind which would make us feel that it is safe to wait or do preliminary drainage? In the patient in whom the temperature tends to come down tenderness tends to become localized, spasm tends to disappear, and the general reaction continues favorable, we believe that it

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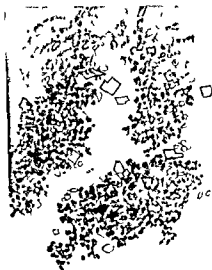

FIG. 181—Cholesterin crystals and calcium bilirubin pigment from bile obtained by duodenal drainage in a case of cholelithiasis. This finding is

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of all the gallstone cases we operated upon That gave us a
discovery of common duct stones of 8 per cent During this
past year we have opened the common duct and looked for
common duct stones in 38 per cent of all the cases we have oper-
ated upon for gallstones and we have discovered that 19 per
cent of the cases had common duct stones (Fig 182)
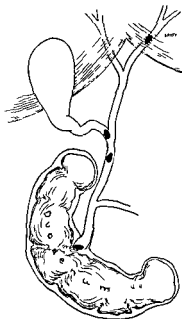
Fig 182—This diagrammatically illustrates the common points at which
stones in the common and hepatic duct lie In the liver with in the branches
of the hepatic duct at the junction of the cystic and common duct in the
common duct and in the common duct at the ampulla of Vater It is at the
common duct at the ampulla of Vater where the duct is surrounded by the
head of the pancreas that common duct stones are so easily overlooked

We used to delude ourselves I think into the belief that
when we took a patient s gallbladder out for gallstones and he
came back with a pain similar to the original one, he had a plug
of mucus or that it was an adhesion or something of that sort,
which was causing his trouble I believe that this is rarely true
When you operate on a patient for gallstones take out his gall

is safe to wait because after all the gallbladder becomes easily
walled off by the adjacent duodenum the overhanging edge of
the liver the hepatic flexure and the omentum If on the
other hand at the end of two three or four days tenderness
persists *temperature remains elevated* the white count continues
high and no improvement in the case is discernible then we
believe that the case demands preliminary drainage of the
gallbladder with later cholecystectomy We have learned as
far as the second stage operation goes that it is unwise to
attempt removal of the gallbladder earlier than two months
It takes about two months for all the exudate edema and
reaction about the junction of the common duct cystic duct
hepatic duct and cystic artery to disappear so that an accurate
dissection of these structures can be done and a safe removal of
the gallbladder done without injuring the hepatic duct or the
common duct

We have been very much interested in the question as to
how often we have left stones in the common duct and hepatic
duct after operating on a patient for gallstones I am quite
certain from our experience—and one should not make these
critical statements except about himself—that prior to 1926 we
left a stone in the common duct in one in every ten patients
operated upon Now that is an extraordinarily high percentage
of error to make I think but I believe it was due to the fact
that we did not realize that stones in the common duct can occur
without definite evidence of their presence Out of all the stones
in the common duct upon which we have operated 39 per cent
have not shown jaundice at the time of operation and we have
learned from our experience since 1926 that stones in the com
mon duct can be present in the entire absence of jaundice They
can be nonpalpable so that even though you feel the common
duct over very carefully you cannot feel the stone We have
learned that they can occur even in the absence of thickening
and dilation of the common duct We know now that our in
cidence of common duct stone discoveries has increased from
8 per cent in years previous to 1926 to 19 per cent now Up to
1926 we opened the common duct and explored it in 12 per cent

you have left him with the pathology which originally caused his symptoms Furthermore you have left him with the part of the pathology which will eventually be more apt to cause his death than his gallbladder would It is a stone in the common duct that affects the biliary tree and produces mortality in so many of these cases The mortality of stones left in the common duct and then reoperated at a second stage is 10 per cent as compared with the present mortality today in our experience of the routine gallbladder surgery of 2 2 per cent Therefore it is a very serious error to make to leave stones in the common duct For anyone who is doing gallbladder surgery I should like to point out that the exploration of the common duct does not produce a higher mortality it produces a lower immediate mortality and an infinitely lower remote mortality (Fig 183)

How should you know when to open common ducts and when not? We believe that in any patient who has been jaundiced the common duct should be opened and explored In any patient who has a contracted and thickened gallbladder the common duct should be opened and explored In every patient who has a dilated common duct the common duct should be opened and explored In every patient who has a thickened head of the pancreas the common duct should be opened and explored and the ampulla of Vater region should be explored because that is the point at which we have so often overlooked common duct stones It should also be opened where the gall bladder stones are small and the cystic duct is patent since these pass easily into the common duct without causing symptoms (Fig 184)

The question of the so called painless jaundice has been another difficult problem for us to deal with It has been very depressing to me to explore patients with painless and progressive jaundice only to find that they have inoperable cancers of the head of the pancreas or that their gallbladders are destroyed so that we could not even do cholecystenterostomy and produce even temporary relief We have sought evidence which would be of value in helping us decide for or against exploratory operation in the patient who comes with painless and

bladder and his gallstones and he has a return of pain similar
to the original pain, you have usually left behind a common duct
stone Common duct stones when left behind represent in
the majority of instances, the original pain for which you did
the operation If you take out a gallbladder filled with stones
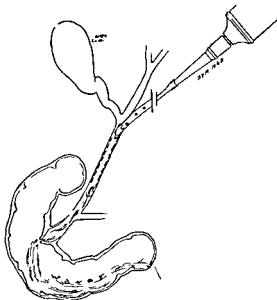
Fig 183—This illustrates the method of passing a catheter down into
the common duct and irrigating the common duct so that the absence of
stones may be demonstrated by the fact that water from the catheter passes
                                                    later into
                                            into the duo
                                            ity of cases
when all the stones are removed   mmon duct
into the duodenum

and you leave a stone in the common duct (this is not entirely
but is relatively true), it would have been better not to have
operated on the patient, because you have not relieved the con
dition that is probably causing most of the trouble You have
taken his time put him through the risk and the expense and

of the mechanics it is fair to say that Courvoisier's law is not infrequently wrong but if you understand the mechanism of the factors that produce Courvoisier's law you will realize how it can be wrong when it is We know that in order to have a gallbladder which can dilate and can be palpable through the abdominal wall you must have two factors you must have a relatively normal gallbladder wall so that it has the elasticity to dilate and a patent cystic duct you must have gradual pro gressive narrowing of the duct below to produce the obstruction Now if we use hydronephrosis as an illustration I think I can make this point clear If you tie a string around the ureter of a normal kidney you do not produce dilatation of the kidney pelvis you produce atrophy of the kidney If on the other hand you have a malignancy of the cervix of the uterus and that spreads out in the parametrium and involves the ureter you then have gradual progressive narrowing of the ureter and you then get hydronephrosis It is gradual progressive narrow ing which produces dilatation while ligation tends to produce atrophy When we find carcinoma of the head of the pancreas it is usually not associated with gallstones or with round cell infiltration and repeated attacks of cholecystitis and destruction of the gallbladder wall but with a normal elastic gallbladder wall That is the reason why the positive portion of Courvoisier's law is so valuable With the gradual narrowing we have dila tation we have jaundice painless and progressive and that case justifies exploration If the gallbladder is dilated even though the obstruction be due to malignancy it is possible to anastomose that gallbladder to the duodenum to overcome the jaundice and to save the patient from the very irritating pruritus which is associated with the jaundice and to permit him to live weeks or months in relative comfort

What on the other hand is the explanation of the fact that the contracted gallbladder in the presence of jaundice is due to stones? It is due to the fact that when one has stones in the common duct there must have existed stones and infection in the gallbladder over a good many years That means that there have been repeated attacks of cholecystitis and with each

progressive jaundice and in that experience Courvoisier's law
has been of great value to us

Courvoisier's law is   In the presence of *jaundice a dilated
palpable gallbladder* which can be felt through the abdominal
wall is indicative of the fact that the jaundice is due to an

F g 184 —Method of introducing the catheter into the common duct
through the split cyst c duct   Note that the common duct can be exposed
beh nd the duodenum by incis ng the parietal peritoneum bes de the duodenu
and rolling the *duodenum inward*

obstruction in the head of the pancreas or in the common duct
from malignancy while the contracted gallbladder indicate
that the obstruction is due to common duct stone   It becomes
obvious that the portion of this law which is of clinical and dia_
nostic value is that portion in which the gallbladder is palpable
What are the mechanics of Courvoisier's law? Before we speak

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abdominal wall you must have two factors, you must have a
relatively normal gallbladder wall so that it has the elasticity
to dilate and a patent cystic duct, you must have gradual pro-
gressive narrowing of the duct below to produce the obstruction.
Now if we use hydronephrosis as an illustration I think I can
make this point clear. If you tie a string around the ureter of
a normal kidney you do not produce dilatation of the kidney
pelvis, you produce atrophy of the kidney. If on the other
hand you have a malignancy of the cervix of the uterus and
that spreads out in the parametrium and involves the ureter
you then have gradual progressive narrowing of the ureter and
you then get hydronephrosis. It is gradual progressive narrow-
ing which produces dilatation while ligation tends to produce
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attack of cholecystitis a round cell infiltration of the wall of the gallbladder, which later becomes cicatrized Courvoisier's law is not of absolute dependability, but if you will add one or two other factors to it, as far as the malignant side goes it becomes quite dependable To sum up, if in the presence of painless and progressive jaundice, together with absolutely and persistingly acholic stools over weeks and there is in addition a palpable gallbladder, then you may almost with certainty make the diagnosis that the obstruction is due to malignancy, and that the only thing that can be done for that patient is cholecystenterostomy

I think, based also on our experience, there is one other point that one should always have in mind and that is that operation on patients with the infectious type of jaundice the so called "catarrhal jaundice," should be carefully avoided There has been a tendency, I think, in the past to feel that if a patient has a catarrhal jaundice associated with a low fever, running over weeks possibly it is justifiable to explore such patients and drain their common ducts It does no good to drain the common ducts or drain the gallbladders in the patients who have liver infection in the biliary tree—which are improperly called catarrhal jaundice but which are in reality infections within the liver cells themselves—and interference with the passage of bile from the liver cells into the bile capillaries

We have been interested in thyroids of course and we can not help or avoid paralleling the infections of the liver with those of severe hyperthyroidism, they do run quite parallel but are similar in many ways We know that one of the danger factors which can be helped in liver infections or in severe hyperthyroidism is the low glycogen reserve in the liver During the period of liver infection or during a severe hyperthyroidism the glycogen reserve in the liver is low, and it is at that stage that the liver tolerates insults very badly in the way of operative procedures or anesthetics Therefore there are two or three things that should always be done in connection with patients who have jaundice and infection One is to employ the most

desirable type of anesthesia which produces the least liver damage. The other is that all measures which will raise liver function should be made use of. The measures which will raise liver tolerance are the administration of glucose and fluids thereby increasing the glycogen reserve in the liver. This is true both in jaundiced patients and those with severe hyperthyroidism. We feel very strongly that no patient with jaundice no patient with liver infection should come into the hospital and be immediately operated upon. Just as with prostates all these patients with jaundice and with liver infections demand long preparation unless they are obviously becoming more intensely jaundiced. That preparation should consist of a high carbohydrate diet large amounts of fluids 3000 cc of salt solution per day with 150 Gm of glucose. We have found also that in the jaundice cases there is no reliable measure for prophesying the question of hemorrhage. We know that in the past Vincent Walters and various others have suggested that the tendency to bleed could be corrected by the administration of calcium and that the bleeding time and coagulation time could be brought down so that one could anticipate that hemorrhage would not occur. However this has not been proved and has been disappointing in practice. Even though the bleeding and coagulation time has been brought to normal—which cannot regularly be done—some of them still bleed. Calcium has been very disappointing in our hands as a preventative of bleeding.

Linton has very recently suggested another measure and that is the sedimentation test and up to within at least two months we thought that the sedimentation test would be an excellent criterion as to whether or not these patients would bleed. But unfortunately we have now had one patient bleed even in the face of normal sedimentation rates. Therefore we have been forced to come back to the position that we know of no measure upon which one can absolutely depend that bleeding will not occur. We know that calcium is not reliable. The sedimentation rate is of value. We do know that probably the best single measure preoperatively to prevent bleeding following operation on a jaundiced patient is transfusion. We add to

these patients in addition to high carbohydrate diets fluids and glucose transfusion and finally the anesthesia which produces the least insult to the liver spinal anesthesia

Spinal anesthesia is a risky anesthetic in the hands of the inexperienced It lulls one into a very false sense of security because it leaves the patient so apparently unshocked It is a very bad anesthetic to give to the patient to whom you would like most to give it that is the patient who is a very bad risk the elderly patient and the patient in shock Those are the patients not to give spinal anesthesia to but it should be reserved for the good risk patients We give ethylene combined with regional anesthesia to the bad risk patients But in the particular situation where there is an infection in the liver provided the spinal anesthesia can be given by men who are qualified to employ it and to meet its emergency it is nearly ideal We employ spinal anesthesia more than any other for abdominal operations but it must be given by experts and it must not be given to the bad risk cases

In summary we believe that all patients with gallstones should have operation unless there is some other condition contraindicating it Early diagnosis will be possible if patients complaining of indefinite digestive symptoms are investigated by a complete gastro-enterological examination employing the

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mote and will avoid the irreparable damage to the liver due to long standing infection The common duct should be more frequently opened and explored if one is to avoid leaving stones resulting in a persistence of the same symptoms Exploration of the common duct does not result in greater morbidity nor mortality Acute cholecystitis should be treated conservatively Adequate preoperative preparation in acute cholecystitis and in the jaundiced patient combined with a properly selected anesthetic will result in a lower mortality

THE SURGICAL MANAGEMENT OF OBSTRUCTIVE JAUNDICE

Howard M Clute

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For the purpose of this article it is assumed that a preliminary diagnosis of obstructive jaundice has been made and measures for its relief are to be undertaken The most common cause of obstructive jaundice in adult patients is common duct stones In older patients the obstruction may be due to cancer of the bile ducts or of the pancreas In patients previously operated upon for biliary tract disease it may be due to a stricture of the common or hepatic bile duct and in young individuals perhaps the commonest cause of obstructive jaundice is an infectious cholangitis Regardless of the cause of the obstruction to the outflow of bile from the liver the presence of biliary obstruction and the accompanying jaundice is a very special problem in treatment because of the far reaching effect of the biliary tract obstruction not only upon the liver but also upon the entire body

The altered physiology in obstructive jaundice therefore prescribes the preliminary treatment commands the technical procedures that are used and dictates the postoperative management in every case The particular effects that we may observe in jaundiced patients can most readily be noted by the changes in liver function the alterations of kidney function and frequently by the disturbance of the blood clotting powers of the blood Successful management of the jaundiced patient must take into account these three factors and its success will depend directly upon the adequacy of their treatment

THE PREOPERATIVE MANAGEMENT

Upon the patient's admission to the hospital our effort is directed to the determination of his condition first by personal

observation and examination and, secondly, by various labora
tory procedures There is no single test of liver function which
is adequate or reliable No doubt this is due to the fact that
the liver has such a large reserve power that relatively small
amounts of normal liver tissue may carry out the function of the
entire organ It is however true that a daily estimation of the
bilirubin contents of the blood gives us indirectly an estimate
of the liver function as a whole If the bilirubin is very high we
may assume that the liver as a whole is seriously damaged
If on the other hand, the bilirubin is low we may assume that
the damage is slight If daily estimations of the bilirubin show
it is steadily rising we feel that the obstructive process is becom
ing complete and that the danger from liver damage is definitely
and daily increasing

The urine test devised by Wallace and Diamond for the
presence of urobilinogen in the urine is easy to perform and
very suggestive in its interpretation The test is performed by
adding 1 cc of Ehrlich's aldehyde to 10 cc of urine and warming
the test tube If a rose color develops urobilinogen is present
The determination of the amount of urobilinogen is equally
simple by diluting the specimen and noting the dilution at which
the reaction is still present If no urobilinogen is present in the
urine we know that the biliary obstruction is complete If on
the other hand, urobilinogen is present in dilutions of more
than one to twenty we may assume that liver damage is exten
sive In rare cases in which the urobilinogen has been present
in as high a solution as one to two hundred liver damage has

tient s kidney function after his admission to the hospital
Thus a daily estimation of the nonprotein nitrogen in the blood
and occasional estimations of the phenolsulphonphthalein out
put of the kidneys in the urine is of particular importance and
value in prescribing the preoperative treatment

The tendency to hemorrhage which patients with obstruc
tive jaundice so frequently show is one of the chief dangers to

be encountered in the surgical management of this condition
As yet there is no absolutely reliable laboratory test by which
this hemorrhagic tendency may be predicted although many
attempts have been made to devise such a test and much study
is still under way in this direction   There are numerous facts
which are well recognized about the tendency to bleed   Thus
it is known that in general the patients who have had an ob
structive jaundice for a long period of time are much more prone
to bleed than those who have had jaundice for but a few days   It
is generally accepted that the bleeding time and the coag
ulation time of the blood in these patients cannot be taken as
indices of the tendency of the patients to bleed after operation
Thus most surgeons have had the experience of postoperative
hemorrhage in jaundiced patients in the presence of a normal
coagulation time and also of a failure to have postoperative
hemorrhage in patients with abnormally long coagulation time
In 1929 Bancroft and Kugelmass and Stanley Brown worked
out a coagulation index of the blood and Lewisohn has recently
used this as an index of the tendency to bleed   Sufficient work
has not yet been done with this test however to properly evalue
it   Linton in 1930 suggested that an increased rapidity of the
sedimentation rate of the red blood cells in obstructive jaundice
indicated a definite tendency to bleed   He used as an index of
normal sedimentation the rate at the end of thirty minutes and
he stated that when the cells settled more than 30 mm in thirty
minutes that the sedimentation rate was rapid and that hemor
rhage could be predicted   Conversely it was his finding that
when the sedimentation rate was low in the thirty minute period
hemorrhage would not occur

This is such a simple test to apply and the need of such a
method for estimating the tendency to bleed in jaundiced pa
tients is so great that we have undertaken the study of our
recent jaundiced patients with this particular point in mind
There have been two exceptions to Linton's findings in our
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the other hand urobilinogen is present in dilutions of more than one to twenty we may assume that liver damage is extensive In rare cases in which the urobilinogen has been present in as high a solution as one to two hundred liver damage has been found to be extensive and severe

Since kidney failure is the second serious factor to be met in jaundiced patients we carry out immediate studies of the patient s kidney function after his admission to the hospital Thus a daily estimation of the nonprotein nitrogen in the blood and occasional estimation of the phenolsulphonphthalein output of the kidneys in the urine is of particular importance and value in prescribing the preoperative treatment

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It is fortunate that the treatment of all three of these possible difficulties which may be present in the jaundiced patient before operation can be managed by the same therapeutical measures—namely, the administration of fluids and of glucose The use of glucose in obstructive jaundice has long been known since Kehr first suggested it and many other surgeons have emphasized its importance Raudins recent work demonstrates more fully and more completely the life saving value of glucose in obstructive jaundice We attempt the administration of glucose or carbohydrates and fluids in these jaundiced patients before operation first by mouth giving them as much fluid as they can readily manage and also by a diet largely made up of carbohydrates We prefer not go give them more than a very small amount of protein It is frequently possible to give them large amounts of fluids by rectum as well in this preoperative period In addition to these two methods of administration intravenous salt solution with glucose in a 10 per cent solution and subpectoral salt solution with a 5 per cent or less glucose solution are given each day Before the operation we administer subpectorally or intravenously at least 1000 cc of salt solution with 75 to 120 Gm of glucose daily

The increased administration of fluid in this preoperative period tends to overcome any kidney failure which may be present since the glucose acts as a direct stimulant to the urinary excretion and the salt solution by diluting the urine diminishes irritation of the urinary and bile salts on the kidney parenchyma Furthermore since the glucose so readily replaces the glycogen storage of the liver and permits rapid liver repair the liver is once again able to resume more of its function and thus decrease the load upon the kidney

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There is increasing doubt as to the value of calcium treatment
in the prevention of hemorrhage in obstructive jaundice   Ravdin
finds that calcium effects the coagulation time of the blood in
only rare instances   Zimmerman and also Linton concur in this
finding and believe that the hemorrhagic diathesis is not re
lated to lowered blood calcium   Our own experience with
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preventing hemorrhage at operation or in stopping hemorrhage
once it had occurred   We therefore no longer use intravenous
calcium as a routine in the preparation of jaundiced patients for
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we employ these in two ways   First in seriously ill patients who
have a rapid sedimentation rate and who we believe will bleed
at operation transfusion of whole blood is given the day before
or the morning of operation   In jaundiced patients who are in
good condition and whose sedimentation rate is slow   we reserve
transfusion until definite indication of bleeding arises   Daily
sedimentation rates after operation are done and if the rate rises
rapidly to a figure above 40 mm in thirty minutes we give the
patient a transfusion   If the drainage from the common duct
becomes pink in color or if the patient coughs up blood or passes
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There is increasing doubt as to the value of calcium treatment in the prevention of hemorrhage in obstructive jaundice Ravdin finds that calcium effects the coagulation time of the blood in only rare instances Zimmerman and also Linton concur in this finding and believe that the hemorrhagic diathesis is not related to lowered blood calcium Our own experience with calcium has not demonstrated to us that it was of value in either preventing hemorrhage at operation or in stopping hemorrhage once it had occurred We therefore no longer use intravenous calcium as a routine in the preparation of jaundiced patients for operation

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even the best surgeons that a stone in the ampulla of Vater may be left undetected at operation If however, a soft rubber catheter readily enters the duodenum and if irrigation of the common duct reveals no fragments of stone and the fluid flows readily into the duodenum it is probable that no further stones are present Palpation of the head of the pancreas where the duodenum is joined by the common duct is technically difficult and often confusing Whether one has an early malignancy of the pancreas or of the ampulla or a stone in the common duct or merely a pancreatitis is often problematic

When the gallbladder has been previously removed the common duct is best approached by entering the abdomen just at the lower border of the liver and following the liver border down until the duodenum is encountered The duodenum then can be gently dissected away from the liver adhesions separated and when the duodenum is rotated toward the midline the common duct at the lateral border of the gastrohepatic omentum is at once visible

In patients who are seriously jaundiced and in whom the danger of hemorrhage is great a two stage operation will occasionally be desirable The first essential of the operative procedure in obstructive jaundice is the relief of the obstruction in the common duct This should therefore be first undertaken If the obstruction is due to stone in common duct the removal of the common duct stone from the duct and the simple drainage of the gallbladder is at times preferable to the removal of the gallbladder The added trauma of cholecystectomy and the increased chance of hemorrhage from the liver bed which it produces may be the deciding factor against recovery If the head of the pancreas is indurated and one is uncertain as to the presence of malignancy common duct drainage and drainage of the gallbladder without removal of the gallbladder is desirable If th

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patient

anastomosis to the stomach or duodenum at a later date to overcome the jaundice

effective Since the transfusion of whole blood is now simple by either the multiple syringe method or with a mechanical means such as the Drummond apparatus we feel that whole blood is definitely indicated for these patients when necessity arises for transfusion

It is not my desire at this time to discuss at length the various technical procedures involved in the actual relief of the biliary duct obstruction but it is desirable at this time to discuss briefly some of the purely technical procedures as they affect the management of the jaundiced patient

Not infrequently we have been able to make the diagnosis of obstructive jaundice and recommend operation for the condition although we were uncertain as to the exact cause of the obstruction of the common duct Whether one feels certain as to the cause of the obstruction at the time of operation or not certainly a most careful exploration of the biliary tract should precede any operative procedures on the common duct or the gall bladder

In no abdominal surgery is adequate exposure and visualization of the field more important and more essential than in the surgery of the common duct For this reason we have found that the complete muscular relaxation which is so readily obtained with spinal anesthesia is a factor of immense value in these patients Furthermore the avoidance of ether in these patients is highly desirable since it is another irritant that must be excreted by an excretory system already overburdened

When no previous operation has been performed upon the biliary tract exposure of the common duct is relatively simple This we carry out by the placing of wet packs over the duodenum so that the duodenum may be retracted downward and rotated inward toward the midline This places the gastrohepatic omentum clearly in view and the common duct under direct vision Before removing the gallbladder it is desirable to explore the common duct A longitudinal incision is made in it and with scoops stone forceps uterine probes Kelley snaps and the operators finger if possible the patency of the duct is established It is all too common an experience among

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If the operative procedure discloses a stricture of the common bile duct or the common hepatic duct the decision as to the operation of choice for the correction of this obstruction is a most important one   The least surgical procedure should be done which promises a satisfactory and continued drainage of bile into the intestines through a patent duct   A direct anastomosis of the common duct into the duodenum is probably the method of choice if a satisfactory suture can be obtained and if the patient can stand the operative procedure   If the stricture of the duct is relatively small a plastic repair is simple and in many cases entirely adequate   An end to-end anastomosis of the injured duct is followed by a return of the stricture in the majority of cases   It certainly should not be undertaken as the procedure of choice   If the common duct is so badly disintegrated that none of these procedures are possible an external biliary fistula must be established with the hope of later successful transplantation of the fistula into the intestinal canal   This however, we believe is the last procedure to be considered since under even the best conditions the results are so frequently unsatisfactory

In obvious cancer of the head of the pancreas with a dilated gallbladder the operation of cholecystogastrostomy will frequently give the patient marked relief from the itching of their jaundice and make their remaining days more comfortable   This procedure too may be done in two stages as suggested by Walters with a preliminary cholecystostomy and a later anastomosis of the gallbladder to the stomach or duodenum

POSTOPERATIVE CARE AND MANAGEMENT OF COMPLICATIONS

In patients who have been seriously jaundiced for long periods of time occasionally a postoperative reaction called liver shock occurs   This condition is different from the postoperative shock due to the trauma of the surgical procedure   Usually the onset is some hours after the operation is completed when the operative shock has largely disappeared   It is marked by a tremendous depression of all body functions   The blood pressure drops to 80 mm of mercury systolic or lower   the pulse is usually

slow and soft the patient is apathetic and markedly asthenic impassive or even semiconscious Occasionally the situation grows rapidly worse and death occurs The precise cause of liver shock is not known but it has been suggested by Ravdin that it was due to the liberation of depressor substances arising in damaged liver cells by the relief of the common duct obstruction It is also possible that traction upon the liver the common duct the portal vein and the hepatic artery incident to the operation may produce a profound degree of shock This has been our clinical experience in the past when a sand bag was placed beneath the patient's back in order to bring the common duct into better view and immediately following this procedure with its traction upon the structures in the gastrohepatic omentum a marked and serious drop in blood pressure has occurred We have given up the use of all methods of raising the back since spinal anesthesia permits satisfactory exposure without it The treatment of this condition known as liver shock is by the administration of intravenous saline with adrenalin and with glucose and such other stimulation as is indicated The patient should be kept flat in bed and possibly have in addition the foot of the bed elevated

Occasionally after operation kidney failure becomes apparent by the rising nonprotein nitrogen and the diminishing excretion of urine This condition is best managed by the administration of glucose and salt solution intravenously Often 200 cc of 20 per cent glucose intravenously will stimulate kidney secretion immediately

Postoperative hemorrhage is the complication perhaps most serious after operation in obstructive jaundice Usually whole blood transfusions will protect the patient against bleeding for three to five days Daily sedimentation rates which show increasing rapidity indicate to us the probability of hemorrhage Ink staining or blood stained drainage from the cigarette drain in the wound or from the common duct tube are the earliest indications of hemorrhage and at their occurrence transfusion should be undertaken at once Nothing can be gained by delay or debate once obvious bleeding is evident and much can be lost

If the operative procedure discloses a stricture of the common bile duct or the common hepatic duct the decision as to the operation of choice for the correction of this obstruction is a most important one   The least surgical procedure should be done which promises a satisfactory and continued drainage of bile into the intestines through a patent duct   A direct anastomosis of the common duct into the duodenum is probably the method of choice if a satisfactory suture can be obtained and if the patient can stand the operative procedure   If the stricture of the duct is relatively small a plastic repair is simple and in many cases entirely adequate   An end to-end anastomosis of the injured duct is followed by a return of the stricture in the majority of cases   It certainly should not be undertaken as the procedure of choice   If the common duct is so badly disintegrated that none of these procedures are possible an external biliary fistula must be established with the hope of later successful transplantation of the fistula into the intestinal canal   This, however, we believe is the last procedure to be considered since under even the best conditions the results are so frequently unsatisfactory

In obvious cancer of the head of the pancreas with a dilated gallbladder the operation of cholecystogastrostomy will frequently give the patient marked relief from the itching of their jaundice and make their remaining days more comfortable   This procedure too may be done in two stages as suggested by Walters with a preliminary cholecystostomy and a later anastomosis of the gallbladder to the stomach or duodenum

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after operation by the T tube or the catheter varies in the
different patients In common ducts which are not infected
and from which a stone has been removed or which have been
explored and no stone discovered, we remove the T tube in

Fig 185 —Lipiodol injection into T tube drain in common duct Lipi-
odol has entered the intestine and yet it is seen that the duct does not empty
freely A partial obstruction and severe cholangitis was found at postmortem

eight to twelve days When on the other hand the common
duct is filled with granulation tissue and obviously has had con-
siderable infection for some time we prefer to leave the tube
drainage in place for six or eight weeks and send the patient
home with the tube still draining When a stricture of the duct
has been incised and the area drained we leave a catheter in
place for three months or more In any patient before we
remove the T tube from the common duct we clamp the tube

In most cases jaundice begins to fade appreciably and the bilirubin to drop regularly within six to eight days after the operation We have had the experience however of cases in which this anticipated drop in bilirubin and clearing of the jaun dice did not occur This complication is very disturbing be cause of the fear that one has overlooked some obstructing lesion that could have been removed and because of the knowledge that it frequently spells disaster In our experience we have found that when bile is draining from the common duct tube and bile is appearing in the stools and jaundice is persisting or increasing that a definite cholangitis is present Usually these patients will have a definite daily fever and occasional chills The treat ment we believe is long continued adequate common duct drain age Once in our experience the persistent jaundice was found at postmortem to be a stricture of one hepatic duct of unknown origin undiscovered at operation In another similar case in our experience the persistent postoperative jaundice was found to be due to a cancer of the head of the pancreas unrecognized or at least only suspected at operation

In patients in whom the jaundice fails to clear adequately and rapidly after common duct drainage it is important to dis cover whether or not the duct is patent It may be that a stone is left in the common duct it may be that the T tube which has been used to drain the duct has become so kinked that ade quate flow of bile through it is impossible In 3 recent cases the injection of lipiodol into the common duct tube and x ray ex amination immediately has been very instructive In the first case in whom no bile was entering the duodenum the lipiodol injection was seen to flow rapidly and easily into the duodenum

bile failed to enter the intestine in adequate amounts when the tube was removed This patient at autopsy was found to have

the

k of

She

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eight to twelve days When on the other hand the common duct is filled with granulation tissue and obviously has had considerable infection for some time we prefer to leave the tube drainage in place for six or eight weeks and send the patient home with the tube still draining When a stricture of the duct has been incised and the area drained we leave a catheter in place for three months or more In any patient before we remove the T tube from the common duct we clamp the tube

Fig 186 — x Ray taken as lipiodol is injected into common duct T tube drain
Lipiodol fills duct and enters duodenum at once

Fig 187 — x Ray fifteen minutes later of case in Fig 186 The lipiodol
has rapidly left the common duct and entered the stomach and intestine The
duct is patent

for varying intervals in order to learn whether or not bile will pass directly through the ampulla into the duodenum without pain and distress or whether it leaks around the tube due to

Fig 188.—Chart used in cases of obstructive jaundice to facilitate the daily course of the patient

failure of the common duct to drain If two or three trials of two to ten hours of such clamping demonstrates the patency of the common duct, the T tube is removed

It is apparent when one considers the various chemical examinations that are necessary each day in jaundiced patients the extensive intravenous and subpectoral medication that is required, the careful management of the common duct drain and the close observation of the patient before and after operation for complications that the patient with obstructive jaundice presents a problem which must, if handled successfully, be a most personal one for the surgeon The condition of these patients changes rapidly within a few hours from one which is satisfactory to one which is most disturbing In any case the ultimate recovery in these patients is dependent fully as much upon their preoperative and postoperative care as upon the technical correctness of their surgery

OBSTRUCTIVE JAUNDICE DUE TO STRICTURE OF THE COMMON DUCT CASE REPORTS

Howard M. Clute

I TRAUMATIC RUPTURE OF THE COMMON DUCT

Strictures of the common duct arise most commonly from injury at the time of some operative procedure on the biliary tract In the 26 cases of common duct strictures that we have seen 20 followed a previous operation on the biliary tract The next common cause of stricture of the common duct is ulceration following infection or common duct stones This accounted for 5 cases in our experience Injury of the common duct resulting from some serious accident usually a crushing injury is extremely rare No doubt it is usually true that an injury sufficiently severe to produce a rupture of the common duct will in itself be fatal before stricturing of the duct occurs The following case report of a traumatic rupture of the common duct followed by a stricture and obstruction is therefore of particular interest first because of the unusual etiology involved second because of the diagnostic difficulties pertaining to it and third because of the complicated surgical and medical management that it made necessary

The patient a young married woman twenty seven years of age Case No 18 283 was admitted to the clinic on September 20 1930 She stated that on July 26 1930 she had been in a serious automobile accident following which she was confined in a hospital and in her home for three weeks and a diagnosis of serious internal abdominal injuries was made During this hospital visit she vomited constantly and was at first in very serious condition She improved however and the vomiting stopped On September 13, 1930, the vomiting recurred and

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believe that she had a common duct stone with no pain and her youth made it seem unlikely that she had a cancer of the pancreas. When jaundice is definitely established as obstructive in origin we feel very strongly that active measures should be taken at once for its relief. Rarely can anything be gained by long delay once this diagnosis is established. We feel it is important to emphasize the necessity in jaundiced patients of first
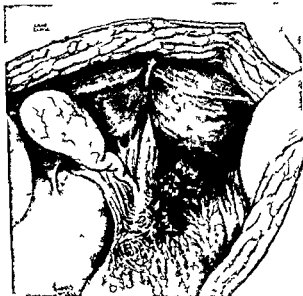
Fig. 189—Case 1. Findings at first operation. Note evidence of old rupture of liver extending into gastrohepatic omentum and involving the common duct. Note distended gallbladder and cystic duct.

establishing a definite diagnosis as early as possible as to whether the jaundice is obstructive and therefore surgical in origin or not and secondly of instituting active measures for its correction rather than adopting a policy of watchful waiting.

On February 14th operation was undertaken and a most unusual and to us surprising condition was discovered. Definite evidence of a previous rupture of the liver was found with a collection of old necrotic liver tissue on the inferior surface of

three days later on September 17th jaundice appeared for the first time

Examination of this patient on her admission showed a visible jaundice in the skin and extreme tenderness over the entire right abdomen more marked in the upper quadrant Her urine showed bile her bilirubin was 1 8 her stools showed bile A Graham test intravenously showed no filling of the gallbladder and some mottling that was thought might be due to stones but probably was not Duodenal drainage was done which showed columnar epithelial cells and pus No gallbladder bile could be obtained with magnesium sulphate stimulation

The patient remained in the hospital until October 14 1930 During this hospital visit her jaundice cleared up the bilirubin dropped to 0 7 the stools were well colored and the bile in the urine completely disappeared Because of the youth of the patient the absence of pain and the clearing of the jaundice and the reappearance of good quantities of bile in the stools it was our feeling that she was suffering from simple catarrhal jaundice As we look back over the case it is surprising that the automobile accident in the preceding July did not at that time make more impression upon us in our early care of the patient

The patient remained at home for nearly four months and was alternately well and sick during this period Occasionally she vomited occasionally slight jaundice appeared On November 8 1930 she had slight visible jaundice her bilirubin was however only 0 5

On February 7 1931 she was readmitted to the hospital Vomiting was the leading difficulty of which she complained and recently jaundice had become much more severe Her stools were now very light in color her urine had 1+ bile and blood examination showed a bilirubin of 3 9 Duodenal drainage at this time showed that no bile was entering the duodenum the urine showed no urobilinogen

From these findings it became apparent to us that this patient was suffering from an obstructive jaundice and that surgical exploration of the common bile duct was indicated We did not suspect a stricture of the common duct we could not

to establish thorough drainage of the biliary tract first and at a later time to anastomose the gallbladder to the stomach

The patient made a very satisfactory convalescence from this operation The gallbladder drained bile readily, as did
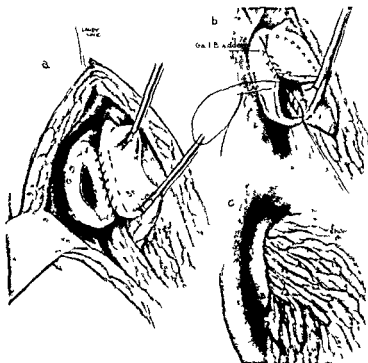
Fig 191—Case I Final procedure to reestablish bile flow by anastomosing gallbladder and stomach In (a) the small drainage hole in the gall bladder is seen Observe that this is made much larger as the anastomosis is done (b) In (c) the omentum has been used to reinforce the double line of sutures

also the tube in the common duct After a few days this bile was given to the patient by mouth and upon its administration in this way her condition improved rapidly and markedly No postoperative bleeding occurred The sedimentation rate of the red blood cells remained slow and no transfusions were necessary

the right lobe, which at first resembled a large abscess The
gallbladder was distended as was also the cystic duct and the
common duct In the gastrohepatic omentum above the duo
denum and involving the region of the common duct was a
mass of extremely dense firm fibrous tissue The common duct
was opened before the gallbladder was interfered with and with
probes it was found that a complete occlusion of the duct was
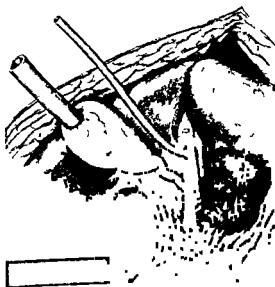
Fig 190 —Case 1 Procedure at first operation to overcome the obstruc
tive jaundice Common duct drained gallbladder drained and preserved for
later anastomosis 9

present in the area in which the fibrous tissue was so apparent
A T tube drain was therefore inserted into the common duct
The gallbladder was now opened and light colored bile with no
stones were found in it It was debated whether an immediate
anastomosis of the gallbladder to the stomach to reestablish a
continuous flow of bile into the intestinal tract was indicated
We were uncertain however whether the cystic duct was patent
The patient s condition was not good and it seemed to us wiser

On the day after the operation the patient's condition was even worse Her blood pressure dropped to a systolic of 60 and at times went below this point and was not detectable There was no evidence of hemorrhage We could only account for the seriousness of her condition on the basis of so called liver shock Another blood transfusion was done which improved her condition somewhat Adrenalin and salt solution were also given and glucose which had been given her constantly was continued

Fig 193—x Ray some hours later than that in F g 192 L p odol has sj read into the hepat c ducts but none has entered the intest nal canal show ing a completely ols ructed con n on duct

About thirty hours after operation the profound depression clear d up and the patient went on to make a most satisfactory recovery On May 14th she was discharged from the hospital in excellent condition Her wound had healed by first intention She had no further jaundice her stools were well colored with bile her urine contained no bile and her bilirubin was 0 2

A recent report from this patient's physician states that she has had one attack of chills and fever with slight jaundice since

On April 23d all drainage had ceased from the common duct
from which the tube had been removed some time previously
when it was apparent that the cystic duct was patent and that
adequate drainage would take place through the gallbladder
At this time a lipiodol injection was made into the gallbladder
to demonstrate by x ray the patency of the cystic duct and also to
discover whether or not any bile was entering the intestine The
patient was taking bile by mouth which of course gave colored

F g 192—x Ray of l p odol nject on through gallbladder dra nage tube n
Case I Note that no l p odol passes nto the duodenum

stools The x ray pictures showed no emptying of lipiodol
through the common duct into the duodenum (Figs 192 193)
On April 27th a second operation was performed and the
gallbladder was anastomosed to the stomach This procedure
was not difficult technically nor did it require a long period of
time The patient s condition however was extremely poor
and for this reason blood transfusion was done following the
operation

The patient was a young married woman twenty seven years of age, Case No 20,632 She was admitted to the clinic on February 12 1931 Four months before admission her gall-bladder had been removed in another city for gallstones Following the operation bile drained from the wound for eight weeks

Fig 194—Case II Complete stricture of common bile duct from removal of part of common duct at cholecystectomy Note in (a) the good mucous membrane available for suture In (b) is shown a stub of cystic duct still present which was removed to enlarge the opening for suture In (c) and (d) are shown the details of the suture and the T tube drainage of the duct It would perhaps be preferable to drain the duct through a separate incision above or below the suture line rather than through it

and the stools were clay colored When the drainage ceased from the wound she became jaundiced and this jaundice has persisted for the past two months and grown more severe Her stools have been constantly clay colored and her urine very dark She has had no menstrual periods since October 19, 1930

she returned to her home but otherwise has been doing well in every way

There were many interesting factors in this patient as one reviews her case If we had known at the beginning of her case as much as we did at the end we undoubtedly could have saved her much time and a long illness by a cholecystogastrostomy done early in the course of our treatment In a similar case should one occur it is probable that one could make the diagnosis of obstructive jaundice at an earlier stage and institute active operative treatment at that time The marked improvement which this patient had following the administration of her own bile by mouth was most impressive to us in this instance and has been a frequent observation in our experience Many patients cannot bring themselves to drink their own bile even though it is disguised in orange juice or chocolate In such cases the bile may be given by a nasal tube and although this is a considerable effort for the patient nevertheless the improvement which they experience seems to make it worth while The apparent liver shock following the second operation was surprising to us in view of the fact that her jaundice at the time of this operation was only slight and that she had been draining bile copiously for several weeks Ravdin's explanation that liver shock is due to the sudden release into the circulation of depressor substances formed in the liver and set free by the drainage of the bile ducts would not seem to apply particularly in this case It may be as Ravdin has suggested related to the loss of chlorides and of calcium by the prolonged bile drainage

II. OPERATIVE INJURY OF THE COMMON BILE DUCT

This second case report is given because it illustrates the serious result which may follow the careless manipulation of the

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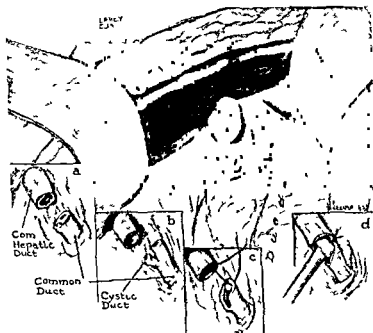

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most particularly the fact that in these seriously jaundiced patients constant watchfulness and particularly persisting endeavor may produce a satisfactory end result

proving Bile was appearing in the stools and the tendency to ooze which had required five whole blood transfusions to control had now disappeared A new complication however arose in the presence of a daily high fever for which we were unable to discover a positive cause

It has been our experience in operations about the bile ducts in the presence of jaundice that hemorrhage and infection in this area are prone to occur We therefore suspected that a sub phrenic abscess might be forming and x rays were repeatedly taken to demonstrate whether the diaphragm was high and fixed on the right side or not By x ray the evidence of sub phrenic abscess was suggestive but not positive because of the pleural effusion which had been present in the right chest On March 17th therefore a tap was made with a large needle into the subphrenic area and no pus or fluid was obtained Three days later the patient developed diarrhea with much rectal tenesmus and a rectal and vaginal examinaton showed a large fluctuant bulging collection of fluid in the pouch of Douglas This was released by an incision in the vaginal vault and the drainage of at least a quart of blood stained fluid and old blood clots

Following this vaginal drainage we felt that doubtless the cause of the fever had been found and the patient would go on to recovery Unfortunately however the fever continued each day the temperature rising to a varying amount On April 14th cystoscopy and pyelogram of the right kidney were carried out and this showed no abnormality in the urinary tract On April 14th therefore after careful consultation and deliberation it was decided to explore the subdiaphragmatic region to determine if possible whether an hepatic abscess or a subphrenic abscess was present which could not be reached with diagnostic taps that had been repeatedly carried out

Under local anesthesia 5 inches of the tenth rib were resected in the midaxillary line Numerous adhesions were present between the diaphragmatic and parietal pleura which walled off the pleural cavity and made incision of the diaphragm at this time quite safe The diaphragm was opened and a large necrotic

On examination she was found to be definitely and markedly jaundiced very emaciated and three months pregnant Laboratory examination showed 4+ bile in the urine no urobilinogen bilirubin 1.5 and a coagulation time of the blood of eleven minutes

She was prepared for operation by the administration of fluids and carbohydrates by mouth by intravenous and subpectoral salt solution and glucose and on February 17 1931 operation was undertaken At the operation it was found that about an inch of the common duct had been completely removed The blind end of the common hepatic duct was found as was also the blind end of the common duct about an inch away Since it was readily possible to bring these ends closely together and since good mucous membrane was present at each end an end to end anastomosis of the duct was undertaken around a T tube drain Blood transfusion was performed after the operation and 500 cc of whole blood given

On February 19th bleeding occurred and another transfusion was given On February 21st more bleeding occurred and in addition a miscarriage of three and a half months pregnancy took place The miscarriage was completed without any interference and another transfusion was given at this time On February 21st the patient showed evidence of a suppression of urine her output being only 3 ounces in the twenty four hours Daily subpectoral and intravenous saline with glucose were given and on the 24th the urinary output and also the bile drainage from the wound materially increased On February 25th more bleeding from the wound occurred and a transfusion given At this time it was noted that the right chest was dull and without breath sounds Two days later on February 27th an x ray showed pleural effusion in the right side

On March 4th because of persistent oozing from the wound another blood transfusion was given and two days later the chest was tapped and much bloody fluid withdrawn In the week following two more chest taps were done at which from 500 to 800 cc of bile-stained fluid were removed from the chest at each time By this time the patient s jaundice was definitely im

more dangerous as to the immediate postoperative result Finally this case illustrates the terrible penalty that patients must pay for the injuries produced on their common duct by accidents at the time of cholecystectomy

abscess in the liver containing broken down liver tissue and old blood clots was found Cultures from this abscess showed no growth Microscopical examination of the tissue showed necrotic liver tissue and broken down blood clots Following the incision of this abscess another transfusion was given

The patient's recovery after this last operation was rapid and uninterrupted and on May 16th, over three months after her admission to the hospital she was discharged Her wounds were all healed She had no jaundice, no fever and save for her marked weakness and her emaciation she was in excellent condition Since this patient has returned to her home she has remained well with the exception of one attack of fever and chills which soon cleared and with which she had no jaundice (Last report January 10 1932)

Several interesting points are presented by this case To us I believe it demonstrated the fact that when one has a non malignant type of obstructive jaundice repeated blood trans fusions should be given even though the bleeding seems to be hopelessly persistent Second one wonders whether the large collection of blood and serum in the pouch of Douglas three days after a tap of the subphrenic region was not a direct result of the tapping In future I should hesitate to use as large a needle and to make as many taps in a patient whom we knew had inadequate clotting ability in her blood Third it is inter esting to note that this patient is still alive after more than eleven months with an end to end anastomosis of her common duct We have made an end to end anastomosis of injured common ducts three times and this is the only patient that has gone more than two months without a return of the jaundice and evidence of a stricture at the point of the anasto mosis One cannot but fear that this patient will develop trouble at the point of anastomosis in time and yet it is doubtful that any other procedure could have been carried out on her at the time of her operation with equally satisfactory results Certainly the only other procedure that we might have used was a direct transplantation of her common hepatic duct into her duodenum This I believe would be safer in the long run although perhaps

more dangerous as to the immediate postoperative result Finally this case illustrates the terrible penalty that patients must pay for the injuries produced on their common duct by accidents at the time of cholecystectomy

THE SEDIMENTATION RATE IN OBSTRUCTIVE JAUNDICE

HOWARD M. CLUTE AND J. ROSS VEAL

It is a common experience of all surgeons dealing with obstructive jaundice that the tendency to bleed after operation is not only one of the most distressing and serious complications but also one which can be least anticipated or foretold by any means at present available. Various laboratory and clinical tests have been used for the purpose of detecting the tendency to bleed in obstructive jaundice. These have neither been reliable nor satisfactory. Thus it is common experience that estimations of the coagulation time of the blood and of the bleeding time in obstructive jaundice are not satisfactory indicat ors of the tendency to hemorrhage after operation. Recently Bancroft Kugelmass and Stanley Brown proposed the use of the clotting index as a further possible aid in the detection of the tendency to bleed in jaundice. Lewisohn has applied this study clinically to a group of patients and felt that it was of some value. The objections to this method however are first that although promising it is not proved and second it is at best a most intricate and difficult determination to carry out.

In 1930 Dr Robert R Linton suggested the sedimentation rate of the blood as an index of the tendency to bleed in obstructive jaundice. Normally the sedimentation rate of the blood is slow. Linton found that in those patients who bled after operation the rate of sedimentation of the red cells was definitely increased or rapid and that in those patients who failed to bleed after operation this rate was slow. He therefore concluded from his study that if before operation in obstructive jaundice the sedimentation rate was rapid that bleeding would probably occur and if on the other hand the sedimen

30 min
SLOW   RAPID

the sedimentation rate is rapid The cells are seen to have settled 47 mm in thirty minutes

tation rate was slow bleeding would not occur Since this test was so simple of performance and could be so readily applied in the course of the treatment of jaundiced patients and since the
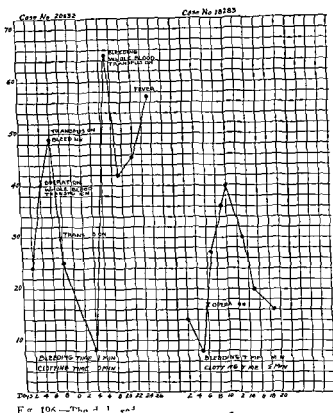
the sedimentation rate thirteen days after operation at which time bleeding occurred and was *again controlled by transfusion* In this case also the sedimentation rate was rapid due to fever three weeks after operation when jaundice had cleared and a subphrenic abscess had developed The second chart Case No 18 283 shows the course of the sedimentation rate *in a patient in* whom no bleeding occurred and no transfusions were necessary Note the postoperative rise in the rate and the rapid fall to a level constantly low

need for an index of the hemorrhagic tendency to bleed is so obvious, we have used this test in such cases in an attempt to further our knowledge of the value of this procedure in obstructive jaundice

30 min
SLOW   RAPID

th rty mnutes

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It is of course, true that there are various factors which will influence the rapidity of the settling of red cells Thus fever, anemia exercise severe infections pregnancy, the cachexia of malignancy—all may effect the rapidity of the settling of the red cells The presence of any one of these conditions in a case must be considered in the interpretation of the results

For the purposes of simplicity and because it seemed to adequately meet the requirements, Linton arbitrarily selected the amount of settling of the red cells at the end of thirty minutes as the index which he would use for the patient with obstructive jaundice He found from this study that if the red cells had settled 30 mm or more in thirty minutes the rate should be considered as definitely rapid If on the other hand the red cells had settled less than 30 mm in thirty minutes the sedimentation rate was slow Our experience leads us to feel that if the sedimentation rate is of value in the prognosis of hemorrhage in obstructive jaundice certainly a higher figure than 30 mm must be taken as the arbitrary point for rapid settling If we take 40 mm as the figure then we find that in general Linton s observations are correct and the sedimenta tion rate is a fairly accurate estimate of the probability of hem orrhage when it is rapid and of no hemorrhage when it is slow Many of our patients had a sedimentation rate as high as 40 and occasionally a little higher in thirty minutes who at no time showed any tendency to bleed Only rarely did we see the rate run above 40 and persist there without the occurrence of hem orrhage

In the majority of the 20 cases that we are reporting here the sedimentation rate was done every day during the period of preparation for operation and for seven to nine days after opera tion With this constant repetition of the rate in each patient occasional sudden elevations of the rate may occur but we do not feel that these elevations are necessarily significant unless they persist from day to day in their position For example in a recent case the rate rose after common duct drainage to a moderate height and on one day went to 50 mm , which was of course a rapid rate and which should indicate the probability of

Since first starting the use of the sedimentation rate we have had 28 patients with obstructive jaundice In the early members of this group an insufficient number of estimations were made to warrant definite conclusions More recently however since the test has become more routine we have had 20 cases in whom we feel that sufficient data is available to warrant consideration It is our purpose in this report to summarize our findings in these 20 patients with obstructive jaundice and to draw such conclusions as we may of the value of the sedimentation rate as an index of the hemorrhagic tendency in obstructive jaundice

Linton in his original work, used the technic for the sedimentation rate recommended by Plass and Rourke This technic has been followed in the laboratories of the New England Deaconess Hospital and the New England Baptist Hospital with but slight modifications as suggested by Miss Hazel Hunt of the Deaconess Hospital laboratory The sedimentation tubes are especially prepared graduated glass tubes which hold from 1 11 to 1 13 cc of blood The graduations on the tube starts from zero at the top to 100 at the bottom in millimeters Four cc of venous blood are collected from the patient s vein and mixed at once in a container with 20 mg of potassium oxalate The blood should be taken to the laboratory at once for the performance of the sedimentation rate since an error may enter if it is left in the ice-box over night before the rate is estimated In the laboratory the blood is transferred from the container to the sedimentation tube with a long capillary pipet as suggested by Miss Hunt The pipet reaches the bottom of the tube and

tively slow rate For example in a healthy young adult they will have settled but 5 to 10 mm in thirty minutes and perhaps only 15 or 20 mm in an hour In any case the red cells will not have settled more than 30 mm in an hour in a normal individual

It is of course, true that there are various factors which will influence the rapidity of the settling red cells Thus, fever, anemia exercise severe infections, pregnancy, the cachexia of malignancy—all may effect the rapidity of the settling of the red cells The presence of any one of these conditions in a case must be considered in the interpretation of the results

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hemorrhage On the following day, however the rate had
dropped again to 32 and never again was rapid No hemor
rhage occurred This one day with a rapid rate does not, in
our opinion necessarily throw out the entire value of the test
since deductions should be made not from a single day s rapid
rate but from the general tendency of the rate after operation

The following chart summarizes briefly the results in the
20 cases of obstructive jaundice in whom the sedimentation rate
has been used

Cases with rapid rates	With bleeding	No bleeding
8	6	2
Cases with slow rates	With bleeding	No bleeding
12	1	11

It will be seen from this summary that the sedimentation
rate is not an absolutely infallible index of the tendency to
bleed in obstructive jaundice In 8 patients the rate was rapid
and bleeding was anticipated yet it only occurred in 6 of these
patients In 2 cases with persistently rapid rates no bleeding
occurred In 12 patients the sedimentation rate was slow and in
none of these was bleeding predicted yet in one hemorrhage
did occur

The question at once arises as to what value if any the sedi
mentation rate offers in the estimation of the probability of
hemorrhage after operation in obstructive jaundice We feel
that our results in these 20 cases show clearly two things first
that the sedimentation rate is not an infallible test for predicting
postoperative hemorrhage Second that the sedimentation rate
has been of definite clinical value to us in suggesting the prob
ability of hemorrhage Almost no test is infallible as to the
clinical results to be expected particularly when it is applied
to a sufficiently large group of patients Exceptions almost
invariably occur and this test is no variation from the rule
Exceptions have occurred but they have not been serious factors
in the management of the patient In general the test has been
a far more adequate index of the hemorrhagic tendency in ob
structive jaundice than any other procedure with which we are
familiar

REPORT OF THREE UNUSUAL CASES OF JAUNDICE

S. Allen Wilkinson

Jaundice is a much respected and properly feared complication in cases which come to surgery. Not only does it predispose to postoperative hemorrhage but the liver damage incident to prolonged obstructive jaundice often results in a stormy convalescence and not rarely in a fatal termination. The cases presented here are illustrative of some of these complications and also show some of the diagnostic preoperative and post operative measures employed to foretell and combat them

In any case with jaundice it is highly important not only to determine the cause of the jaundice but also to learn if possible how much liver damage has occurred and to evaluate the operative risk and the possibility of postoperative complications. The diagnostic tests which have been found of importance include the quantitative van den Bergh the icterus index duodenal drainage of the biliary tract test for uro bilinogen the galactose tolerance test and of course roentgen ray studies

It is now rather generally conceded that the qualitative van den Bergh is of but little diagnostic significance. However the quantitative van den Bergh expressed in milligrams of bilirubin per 100 cc of blood serum gives a definite indication of the degree of bilirubin retention and consequently of the degree of jaundice. The icterus index[1] runs approximately parallel to the van den Bergh and gives similar results

Duodenal drainage after the method of Lyon has proved itself to be a very valuable diagnostic aid and it is particularly of value in cases of jaundice where the common duct is not completely obstructed. In these cases it gives an indication of the type of bile which the liver is capable of excreting or the ability

of the gallbladder to function of the presence of gross infection
in the bile and in many cases it is possible to determine the
presence or absence of a stone in the common duct by micro
scopical examination of the bile A number of observers have
called attention to the fact that cholesterin crystals and calcium
bilirubin pigment in the bile obtained by duodenal drainage
were often found in cases of cholelithiasis Piersol Boxkus and
Shay[1] have emphasized this and state that such a finding is
pathognomonic of stones in practically all cases

The test for urobilinogen as introduced by Wallace and
Diamond[1] has been a particularly valuable one both from a
diagnostic standpoint and as a functional test of the liver In a
case with jaundice if urobilinogen is absent in the urine one
can be certain that the obstruction to the common duct is
complete and that no bile is getting into the intestinal tract
On the other hand if the stools are normally colored and if
urobilinogen is present in the urine a quantitative determina
tion of the amount of urobilinogen gives a fairly accurate index
of liver function Normally urobilinogen is present in the urine
detectable in a dilution of urine of one part to twenty or less
If it is present in a dilution greater than one to twenty it is
taken as abnormal

The galactose tolerance test was introduced as a test of
liver function Results with the test used in this way have been
disappointing but Shay Schloss and Rodis have reintroduced
the test as one example of differentiating obstructive from toxic
jaundice Forty Gm of pure galactose are given on a fasting

" ¬   " ol sugar
excreted is calculated in grams If this amount exceeds 3 Gm
the test is taken to indicate a toxic jaundice If it is less than
3 Gm it is held that the jaundice is obstructive in nature
Used in this way it appears to have definite value The number
of cases in which we have been able to use it has so far been
too few to come to any definite conclusion although results
seem favorable

It is needless to mention that in all cases of jaundice suspected of having surgical aspect the routine blood and urine studies kidney function test and roentgen studies of the gastro intestinal tract are essential factors in accurate diagnosis

It is very desirable as has been mentioned to estimate the function of the liver as well as to arrive at a correct diagnosis Unfortunately there is no single test which will give us any accurate picture of the function of the liver as a whole chiefly because the liver has many functions and it is apparent that one particular function may be greatly depressed and its other functions carry on approximately normally Also it is true that any function test which we possess may give us only slightly abnormal findings when it is very obvious that clinically the patient is in a critical state and even almost at the point of death Nevertheless there are certain tests which we may do and which will give us some indication of the seriousness of the disease which we have to fight A host of tests have been tried and discarded those which have survived aside from those mentioned under the diagnostic studies are very few A high urobilinogen in the presence of jaundice is a fairly accurate index of the degree of hepatic damage The bleeding time and the coagulation time offer but little help as they may be normal in spite of prolonged jaundice and in particular they offer no indication of impending hemorrhage

Clute and Veal[6] have described the value of the blood sedimentation rate in cases of jaundice It seems to be the most accurate and most reliable test we have in foretelling an impending hemorrhage If in the presence of jaundice the blood cells sediment 40 mm or more in thirty minutes the author feels that postoperative hemorrhage is apt to occur If the sedimentation is less than 40 mm hemorrhage is unlikely

Of the various dye retention tests the general opinion is that the bromsulphalein test as introduced by Rosenthal and White[7] is the least toxic and the most sensitive Even this test however offers but little additional information to that which may be gained from the tests already suggested and it has the disadvantage of a certain element of toxicity undesirable in jaundiced cases

of the gallbladder to function of the presence of gross infection in the bile and in many cases it is possible to determine the presence or absence of a stone in the common duct by microscopical examination of the bile   A number of observers have called attention to the fact that cholesterin crystals and calcium bilirubin pigment in the bile obtained by duodenal drainage were often found in cases of cholelithiasis   Piersol Boeckus and Shay[2] have emphasized this and state that such a finding is pathognomonic of stones in practically all cases

The test for urobilinogen as introduced by Wallace and Diamond[1] has been a particularly valuable one both from a diagnostic standpoint and as a functional test of the liver   In a case with jaundice if urobilinogen is absent in the urine one can be certain that the obstruction to the common duct is complete and that no bile is getting into the intestinal tract   On the other hand if the stools are normally colored and if urobilinogen is present in the urine a quantitative determination of the amount of urobilinogen gives a fairly accurate index of liver function   Normally urobilinogen is present in the urine detectable in a dilution of urine of one part to twenty or less   If it is present in a dilution greater than one to twenty it is taken as abnormal

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the right lower lobe and had fluid in the abdomen   In two weeks she had improved but still had a temperature of 100 F   She was draining bile from the common duct but the catheter in the gallbladder had been removed   The bile which she was draining was introduced into the stomach through a nasal tube   She was still jaundiced   In three weeks she was much improved although jaundice was still present   One month after operation she was definitely worse in spite of the lessening of jaundice being delirious most of the time   She was transfused a fourth time and showed noticeable improvement   The temperature fell to normal   The bilirubin reached the level of 2 5 mg   her mind was clear and her temperature about 99 F   About ten days later she became depressed and apathetic   The temperature rose   she grew steadily weaker and died fifty five days after operation   During this period she had frequent and usually daily intravenous injections of saline with glucose

During the postoperative period the urine showed no urobilinogen until bile was introduced into the intestinal tract through the nasal tube   when the urobilinogen rose to 1 200 and stayed around this figure or higher until death   After one month the introduction of bile was discontinued but the urobilinogen remained high indicating that the common duct was open and that bile was draining into the intestine   Bile in the urine gradually disappeared   A lipiodol injection of the common duct through the T tube three weeks after operation showed a widely dilated common duct but the ampulla of Vater seemed to be patent at this time   She had no remarkable change in the blood picture   the blood bilirubin was high 16 3 mg on the day of operation and reached its minimum 1 2 mg one week before she died   The red cell sedimentation rate varied between 22 and 46 mm in thirty minutes   Neither the bleeding nor the coagulation time were abnormal

At autopsy an acute perforating ulcer in the duodenum near the ampulla of Vater was found   The common duct was dilated but the ampulla was patent   The duct contained cloudy bile with scattered particles of dark gritty material   The liver was enlarged   The small ducts were filled with inspissated bile   The

The cases presented here have been studied using some or all of these tests mentioned with the exception of the bromsul phalein test

Case I—Mrs M R age forty seven years admitted with an acute complaint of pain in the right upper quadrant She gave a history of a sudden attack of pain followed by jaundice and acholic stools of one week s duration She had had no previous attacks She had gained 19 pounds in the last year Family and past medical history were irrelevant

Physical examination showed a middle aged woman weigh ing 179 pounds with a definite icterus The pulse was 92 the blood pressure 135/70 The abdomen was soft there was no tenderness rigidity or palpable mass The temperature ranged between 101 and 103 F

The urine was dark strongly positive for bile and contained a trace of albumin from 0 2 to 0 7 per cent of sugar and con tained no urobilinogen The blood count was 5 100 000 red cells 16 250 leukocytes 83 per cent of which were polymor phonuclear and the hemoglobin was 75 per cent The bleeding time was two minutes and fifteen seconds the coagulation time two minutes and thirty seconds The red cells sedimented 11 mm in thirty minutes The blood bilirubin was 9 4 mg per 100 cc the non protein nitrogen 31 Wassermann negative The galactose tolerance test showed an elimination of 1 2 Gm of galactose in five hours A duodenal drainage failed to drain any bile

The diagnosis of choledocholithiasis was confirmed at opera tion A T tube was placed in the common duct and a catheter in the gallbladder The patient had a preoperative and a post operative transfusion

Her postoperative course was unsatisfactory from the start the T tube drained from 8 to 10 ounces of bile daily but the catheter in the gallbladder did not drain Her temperature stayed around 100 F She was greatly troubled with distention and with inability to void One week after operation she had a third transfusion At this time she had signs of consolidation at

the right lower lobe and had fluid in the abdomen In two weeks she had improved but still had a temperature of 100 F She was draining bile from the common duct but the catheter in the gallbladder had been removed The bile which she was draining was introduced into the stomach through a nasal tube She was still jaundiced In three weeks she had much improved although jaundice was still present One month after operation she was definitely worse in spite of the lessening of jaundice being delirious most of the time She was transfused a fourth time and showed noticeable improvement The temperature fell to normal The bilirubin reached the level of 2 5 mg her mind was clear and her temperature about 99 F About ten days later she became depressed and apathetic The temperature rose she grew steadily weaker and died fifty five days after operation During this period she had frequent and usually daily intravenous injections of saline with glucose

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larger ducts were filled with greenish yellow purulent material and scattered gritty masses of pigment Final diagnosis Choledocholithiasis, cholangitis hepatitis acute ulcer of the duodenum and subacute tubular nephritis

Case II—Mrs H P, age forty five years The chief complaint was jaundice of six months' duration Prior to three months before admission, she had been well She first developed a persistent nausea, and six weeks before admission, noticed a gradually deepening painless jaundice For one month she had had intense itching Since the onset of the jaundice the stools had been clay colored the urine dark She lost 15 pounds in weight

She had had scarlet fever at six, typhoid fever at nine, numerous attacks of tonsillitis She had had 2 children, both living Fifteen years ago she had a fibroid removed from the uterus, ten years ago the tonsils were removed and four years ago she had an operation for parotid tumor

Physical examination showed an intense jaundice but nothing else remarkable Abdominal examination revealed a tender spot in the right upper quadrant There were no masses, the gall bladder was not palpable the liver was not enlarged

Laboratory studies showed bile in the urine absence of urobilinogen in the urine acholic stools The blood count was 3,580 000 red cells, 6750 white cells hemoglobin 70 per cent and the differential was normal The bleeding time was three minutes, the coagulation time two and one-quarter minutes The red cell sedimentation rate was 28 mm in thirty minutes the bilirubin was 7 4 mg , the nonprotein nitrogen 24 Wassermann negative A galactose tolerance test showed 1 4 Gm of galactose eliminated in five hours

The preoperative diagnosis was complete obstruction of the common duct, probably due to carcinoma of the head of the pancreas, but the possibility of common duct stone was mentioned

Operation revealed a contracted gallbladder filled with stones The common duct was contracted, but it was explored and found

to contain no bile There were no stones There was no obstruction at the ampulla of Vater The pancreas was of normal consistency The gallbladder was removed and a T tube placed in the common duct The operative diagnosis was chronic cholecystitis cholelithiasis and cholangitis

She was transfused before and after operation She had one or two intravenous infusions of glucose and saline daily The sedimentation rate was 30 mm in thirty minutes on the day of operation It was taken daily thereafter and rose steadily Twelve days after operation it had reached 55 mm in thirty minutes and she began to bleed from the nose mouth and uterus In spite of repeated transfusions she continued to bleed and died on the twentieth day after operation On the day she died her sedimentation rate was 66 mm in thirty minutes The stools were clay colored until she started to bleed and then they became black The urobilinogen was reported as one to fifty on one occasion and one to one hundred on another These determinations were both probably erroneous due to the intense bile stain in the urine All other determinations showed an absence of urobilinogen The galactose tolerance test eight days after operation was 1 04 Gm The bilirubin was 9 4 on the fifth day postoperative and 10 on the twelfth day

At autopsy the abdomen contained a large amount of free fluid with a pinkish tinge

All the organs in the abdomen including the pancreas were normal with exception of the liver The liver was swollen and on section a large amount of cloudy bile under marked pressure came from all the ducts The common duct contained no bile At the junction of the right and left hepatic ducts a definite obstruction was encountered When this was opened a large amount of thick clouded bile gushed out under pressure At the point of the obstruction there was nothing except a stricture There was no evidence of ulceration or of malignancy Microscopical examination showed a very early small colloid carcinoma arising in the mucous glands of the common hepatic duct

Case III—J F age forty four years Admitted with a chief
complaint of jaundice he stated that for eighteen years he had
had digestive troubles diagnosed in 1926 after a gastro-intestinal
x ray study as nervous indigestion In 1978 he began to
have more definite complaint consisting of epigastric pain from
two to three hours after meals relieved by food or alkalis
Repeated x rays showed a duodenal ulcer which was relieved
by Sippy diet In 1929 he began to have attacks of jaundice
coming every three to four months At the onset he would have
chills sensation fever and general malaise lasting four days to
a week

Between attacks the jaundice diminished but never com
pletely subsided His most recent attack was one week before
admission He had lost 45 pounds in three years

The past medical history mentioned pneumonia

The physical examination revealed a rather emaciated
markedly jaundiced man who presented an enlarged liver but
nothing else except hemorrhoids The urine was dark and
showed a strongly positive test for bile a trace of albumin
Urobilinogen was present in a dilution of 1 : 100 The non
protein nitrogen was 30 Wassermann negative bilirubin 0 4
diphasic The blood count was normal gastric acidity one hour
after a test meal was 47 free acid and 56 total There was no
occult blood A duodenal drainage showed a free flow of bile
into the duodenum There was a dark B fraction and micro
scopical examination showed a few bile stained pus cells but
nothing striking There were no cholesterin crystals and no
calcium bilirubin pigment x Ray examination of the stomach
revealed a normal stomach but the duodenal bulb was con
stricted at the peak the second portion of the duodenum being
dilated

At operation the liver was found to be enlarged the gall

bladder slightly distended but easily emptied The common duct was dilated to three times its normal size The pancreas was moderately firm In the duodenum an area could be felt just about the location of the ampulla of Vater which was very suspicious of an old duodenal ulcer There were no stones either in the common duct or the gallbladder A cholecysto jejunostomy was performed

Patient made an uneventful recovery and was discharged on the seventeenth day after operation The jaundice had cleared It has been four months since operation during which time he has felt quite well

Comment—The first case illustrates the largely unexplained and generally poor postoperative reaction that is sometimes encountered The general feeling is that the obstructive jaundice produced by common duct stone should clear promptly on relief of the obstruction Those cases that fail to respond are always trying and usually obscure as to the reason Presumably the liver has been so badly damaged by the back pressure of the bile with the added burden of infection which is present to a greater or less degree that it is unsafe to reassume its normal function The reaction may be similar to that of kidney failure following sudden relief of prostatic obstruction In this case autopsy revealed a widespread involvement of the larger ducts which were filled with purulent material The smaller liver ducts and the liver tissue itself however were relatively free of involvement which probably explained the normal galactose tolerance test taken after operation at the time when the patient was obviously critically ill It is in this type of case particularly that the lack of an adequate test for liver function is very disturbing The high urobilinogen in the urine after the administration of bile by the stomach tube gives some indication of the severity of the liver damage

The second case presented a typical history of carcinoma of the head of the pancreas On physical examination however the gallbladder was not palpable and Courvoisier's law states that, if the gallbladder is distended the diagnosis is probably cancer

of the head of the pancreas while if it is not palpable the diag
nosis is probably common duct stone   There was nothing in the
history suggestive of biliary colic but silent stones are not rare
The result of the galactose tolerance test being less than 3 Gm
pointed to obstructive jaundice and when no definite point of
obstruction was found at operation the diagnosis seemed to be

from the fact that colloid carcinoma of the duct is unusual and
because of its extreme smallness   The pathologist stated that
this was one of the earliest carcinomas that he had ever found
An interesting feature of this case is the steady rise of the sedi
mentation rate   As has been pointed out in another paper in
this issue the sedimentation rate gives warning of impending
hemorrhage in jaundice cases and in many such cases this can
be prevented by whole blood transfusions   Here the hemor
rhage began at 55 mm   a high figure but could not be checked
The complete absence of urobilinogen in the urine indicated a
persisting complete obstruction

The third case illustrates a rare type of jaundice that asso
ciated with duodenal ulcer   There has been no similar case in
any of the duodenal ulcers treated at the Lahey Clinic in the
last eight years   In the literature there are but few cases reported
In an article on jaundice in duodenal ulcer Bickel[5] reviewed the
literature extensively and reported about 50 cases   Most of
these were found at autopsy and in some there were gallstones
He reports 2 cases one of which he feels was probably catarrhal
jaundice   Haines[6] reported a case in 1926 Tuprez and Dumont[10]
reported one in 1930   It would seem that duodenal ulcer should
cause obstruction at the ampulla of Vater much more often than
it does   In this case while the duodenum was not opened it
was reported by the surgeons that the ulcer seemed to palpa
tion to be directly over the ampulla of Vater   Certain it is that
the point of obstruction was directly at the ampulla and the
induration of the ulcer would offer an adequate explanation for

this type of obstruction An interesting phase of this case was the help offered by duodenal drainage This procedure enabled us to say that the obstruction was not complete, that the gall bladder was capable of functioning, and that there was small likelihood of the presence of stones either in the gallbladder or common duct

Summary —Some of the more useful practical diagnostic tests which may be valuable in cases of jaundice have been mentioned

Three cases are presented one of liver failure, following operation for common duct stone, one of complete obstruction of right and left hepatic duct at their junction by small colloid carcinoma and one of partial common duct obstruction, due presumably to a duodenal ulcer at the ampulla of Vater The usefulness of these tests as applied to the individual cases before and after operation, is indicated

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SILENT RUPTURE OF GALLBLADDER PRODUCING HUGE SUBDIAPHRAGMATIC ABSCESS

RICHARD H. OVERHOLT

THE space between the diaphragm and liver presents not only an unfortunate but inaccessible site for the accumulation of purulent material. The seriousness of such a location for an abscess is increased by its close proximity to pulmonary tissue and mechanical disturbances resulting from disturbed respiratory action and mechanical displacement of the liver. Recently a case has come under our care which has been unusual both from the standpoint of the point of origin and from the paucity of symptoms produced.

Illustrative Case—Mr. H. L., age forty four years. This patient came to the clinic August 19 1931 complaining of a swelling in the upper abdomen. This swelling had been present for three months its appearance being accompanied by no symptoms whatever and its enlargement gradual. Three days before the patient presented himself at the clinic he had struck himself over the mass and it had been slightly painful since that time. There were no respiratory gastro-intestinal or urinary symptoms. There were also no toxic symptoms or constitutional defects. Examination showed a middle aged slightly obese white male in apparent excellent health. Examination of the head and neck was negative except for a few palpable lymph nodes in the left posterior cervical region. Examination of the heart was negative. The blood pressure was 130/90. Auscultation of the lungs was negative. The right diaphragm was displaced upward. Upon examining the abdomen a large bulging mass involving the entire right upper quadrant and right lower anterior thoracic wall was found. The mass was rather

a very slight increase in density and there was some fibrosis at each hilum There was no evidence of fluid Anterior portions of the lower right ribs showed nothing abnormal (Fig 197)

Because of the onset without symptoms the gradual enlarge ment the clear lung field and the firm nontender mass together with the positive Wassermann a tentative diagnosis of a gumma of the liver was made The patient was placed on ambulatory antisyphilitic treatment Three weeks later an area over the most prominent portion of the mass was found to be fluctuant This area was located just at the costal border in the midright upper quadrant area Incision into the fluctuant area was recom mended and the patient entered the New England Baptist Hospital on September 10 1931 Under ethylene anesthesia Dr H M Clute made a 3 inch incision just below the right costal margin in the midclavicular line The incision was carried directly through all of the layers of the anterior abdominal wall and a huge abscess cavity entered Between 4000 and 5000 cc of a grayish yellow purulent material escaped and was aspirated By digital traction the presence of a large abscess cavity between the liver and the diaphragm was demonstrated The liver was displaced downward so that its superior surface was well below the level of the umbilicus A large rubber tube was placed in the cavity and the wound closed about this drain A culture of the aspirated material produced no bacteriological growth Microscopical examination showed all of the elements characteristic of pus otherwise nothing else was determined from this laboratory examination

Convalescence was uninterrupted Profuse drainage through the tube occurred and on the third postoperative day periodic irrigations with Dakin s solution were carried out A roentgen examination one week after operation showed the large abscess cavity a medial and downward displacement of the liver and the drainage tube well up in the subdiaphragmatic area (Fig 198) Ten days after operation fragments of what appeared to be gallstones were washed out of the wound during the process of irrigation Several of the stones were submitted to Dr Shields Warren for analysis and he verified the suspicion of gallstones

firm and fixed It was difficult to distinguish whether or not it
involved the thoracic and abdominal walls, or whether it was a
large fixed mass beneath the body wall pushing it outward
There were no areas of tenderness Our first impression was that
it was a large lipoma of the anterior thoracic and abdominal wall
The inferior border of the mass extended from a little to the left
of the midepigastrium down below the umbilicus and about
half way down in the right lower quadrant of the abdomen
Examination of the urine was negative A complete blood count
revealed no abnormality other than an increase in the white

F g 197—Roentgenogram made before large subdiaphragmat c collec
t on was evacuated Note the h gh pos t on of the diaphragm The lower
border of the l er extended below the umb l cus The lung field abo e the
collect on s surpr s ngly free from the usual lung react on

blood cells there being 13 700 per cubic millimeter The blood
Wassermann was positive The nonprotein nitrogen was 20 mg
per 100 cc and the blood bilirubin was 0 2 unit An x ray of
the chest showed the trachea in its normal position The left
leaf of the diaphragm was smooth with a clear costophrenic
angle The right leaf of the diaphragm was smooth also but
elevated so that the shadow of the dome crossed the upper
margin of the fifth rib shadow in the midclavicular line At the
same location the left diaphragm crossed the seventh left rib
Above the elevated right leaf of the diaphragm the lung showed

a very slight increase in density and there was some fibrosis at each hilum There was no evidence of fluid Anterior portions of the lower right ribs showed nothing abnormal (Fig 197)

Because of the onset without symptoms the gradual enlargement the clear lung field and the firm nontender mass together with the positive Wassermann a tentative diagnosis of a gumma of the liver was made The patient was admitted on ambulatory antisyphilitic treatment Three weeks later an area over the most prominent portion of the mass was found to be fluctuant This area was located just at the costal border in the midright upper quadrant area Incision into the fluctuant area was recommended and the patient entered the New England Baptist Hospital on September 10 1931 Under ethylene anesthesia Dr H M Clute made a 3 inch incision just below the right costal margin in the midclavicular line The incision was carried directly through all of the layers of the anterior abdominal wall and a huge abscess cavity entered Between 4000 and 5000 cc of a grayish yellow purulent material escaped and was aspirated By digital examination the presence of a large abscess cavity between the liver and the diaphragm was demonstrated The liver was displaced downward so that its superior surface was well below the level of the umbilicus A large rubber tube was placed in the cavity and the wound closed about this drain A culture of the aspirated material produced no bacteriological growth Microscopical examination showed all of the elements characteristic of pus otherwise nothing else was determined from this laboratory examination

Convalescence was uninterrupted Profuse drainage through the tube occurred and on the third postoperative day periodic irrigations with Dakin s solution were carried out A roentgen examination one week after operation showed the large abscess cavity a medial and downward displacement of the liver and the drainage tube well up in the subdiaphragmatic area (Fig 198) Ten days after operation fragments of what appeared to be gallstones were washed out of the wound during the process of irrigation Several of the stones were submitted to Dr Shields Warren for analysis and he verified the suspicion of gallstones

reporting them to be of the cholesterol pigment type A roent
genogram of the gallbladder area after the intravenous admins-
tration of the dye showed on some of the plates a shadow which
was interpreted as being due to a fairly well filled gallbladder
and there was also some mottling surrounding this circular
shadow which presented the appearance of cholesterol type of
stones outside the gallbladder itself

The patient left the hospital three weeks after operation
with a drainage tube left *in situ* He was then treated as an
ambulatory patient at the clinic from September 29th until

Fig 198 —Roentgenogram of the abdomen a week after drainage of
collection Catheter still in place Note extensive cavity still present at
this time

December 1st during which time the drainage tube was short
ened somewhat but the amount of drainage failed to decrease
materially On repeated occasions gallstones could be washed
out when the wound was irrigated On December 1st lipiodol
was injected through the tube in the wound under the fluoro-
scope and it was found to communicate with a small abscess
cavity beneath the liver in the region of the gallbladder We
were unable to demonstrate any extension of the abscess cavity
at this time into the subdiaphragmatic space We were also
unable to demonstrate the patency of the cystic duct as none of

the oil found its way to the biliary system proper   Examination of the drainage material from time to time failed to show any evidence of bile pigment

Because of the persistency of the drainage and the definite evidence that the original abscess was due to a silent perforation of the gallbladder, and that there existed at this time a mucous cholecystic fistula without communication with the common bile duct, cholecystectomy was recommended to the patient   This advice was accepted and on December 4, 1931, at the New England Baptist Hospital, Dr H M Clute exposed the gallbladder through a right rectus incision in the upper right

Fig 199—Photograph of gallbladder showing complete occlusion of cystic duct by a calculus and a perforation of the fundus   A match stick has been inserted in this opening

quadrant and found a small markedly thickened gallbladder with a perforation 1 cm in diameter at the fundus (Fig 199)   This communicated with the sinus tract   Examination of the common duct revealed no pathology   The gallbladder was removed in the usual retrograde manner and wound closed after a single cigarette drain had been inserted at the base of the liver and carried out the previously formed sinus tract   The right rectus incision was then completely closed   Examination of the removed specimen showed a single cholesterol stone embedded at the head of the cystic duct and its lumen completely obliterated

Following this second operative procedure there was no

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After the evacuation of the collection the persistence of the drainage was due to the presence of a secreting surface in the area drained—a mucous cholecystic fistula The removal of the gallbladder was necessary to bring about healing

occurrence in the convalescence worthy of note The patient
left the hospital symptom free on the eighteenth postoperative
day At this time the rectus incision had healed completel
and a 2 inch catheter end was left in the sinus tract so that it
could be kept opened for a short period of time The patient
was last seen three weeks after his discharge from the hospital
and at this time there were no symptoms or signs of a reaccumu
lation of material either over or under the liver The short tube
drain was still in place in the sinus tract

Comment—The interesting points about this case have to
do with the freedom of symptoms this patient presented both
at the time of the perforation of the gallbladder and later when
a huge collection existed between the diaphragm and liver
Originally the gallbladder must have been packed with man
stones as a great number were washed out of the subdiaphrag
matic abscess cavity on repeated occasions In order to ex
plain the silent perforation we must suppose that an ulcerat on
in the fundus took place gradually so that when the cystic duct
became occluded the break in the wall occurred with little pres
sure from within

The subdiaphragmatic collection attained such a large size
because of the absence of pain the delay in seeking advice the
continual generation of secretion from the wall of the gallbladder

salts never found their way out of the cystic duct and into the
peritoneal cavity or subdiaphragmatic space The patient was
saved the consequences of a bile peritonitis

It is difficult to explain the absence of symptoms resulting
from the mechanical displacement of the liver as was found in

evidence of liver drainage There was some impediment to the
respiratory excursions but the absence of an active inflam
matory process undoubtedly reduced these effects

After the evacuation of the collection the persistence of the drainage was due to the presence of a secreting surface in the area drained—a mucous cholecystic fistula The removal of the gallbladder was necessary to bring about healing

occurrence in the convalescence worthy of note   The patient left the hospital symptom free on the eighteenth postoperative day   At this time the rectus incision had healed completely and a 2 inch catheter end was left in the sinus tract so that it could be kept opened for a short period of time   The patient was last seen three weeks after his discharge from the hospital and at this time there were no symptoms or signs of a reaccumulation of material either over or under the liver   The short tube drain was still in place in the sinus tract

Comment—The interesting points about this case have to do with the freedom of symptoms this patient presented both at the time of the perforation of the gallbladder and later when a huge collection existed between the diaphragm and liver   Originally the gallbladder must have been packed with many stones as a great number were washed out of the subdiaphragmatic abscess cavity on repeated occasions   In order to explain the silent perforation we must suppose that an ulceration in the fundus took place gradually so that when the cystic duct became occluded the break in the wall occurred with little pressure from within

The subdiaphragmatic collection attained such a large size because of the absence of pain the delay in seeking advice the continual generation of secretion from the wall of the gallbladder and on account of the sterility of the material contained in the collection (cultures produced no growth)   Another factor which probably contributed to the paucity of symptoms is that bile salts never found their way out of the cystic duct and into the peritoneal cavity or subdiaphragmatic space   The patient was saved the consequences of a bile peritonitis

It is difficult to explain the absence of symptoms resulting from the mechanical displacement of the liver as was found in the patient   One might have expected ascites from interference in the portal circulation or disturbances from pressure and distortion on the inferior vena cava   There was apparently no evidence of liver drainage   There was some impediment to the respiratory excursions but the absence of an active inflammatory process undoubtedly reduced these effects

After the evacuation of the collection the persistence of the drainage was due to the presence of a secreting surface in the area drained—a mucous cholecystic fistula The removal of the gallbladder was necessary to bring about healing

SUBDIAPHRAGMATIC ABSCESS WITH EXTENSION INTO RIGHT LUNG AND CURE BY PHRENIC EXERESIS

Richard H. Overholt

This case is of particular interest because of the develop ment of one of the most serious complications that may follow an abdominal operation with a protracted course and finally cure by a comparatively minor operative procedure

Illustrative Case — Mrs C R The patient a woman of fifty one years of age came to the clinic in June 1929 com plaining of typical symptoms of calculus cholecystitis The attacks of pain had their onset five years ago There had been a sudden appearance of symptoms in the upper abdomen fol lowed by an operation done elsewhere At that time an acute pancreatitis was found and drainage instituted The report was that nothing had been done to the gallbladder There had been no weight loss and there was no history of jaundice or clay colored stools Symptoms other than those related to the gallbladder disease were not present The past medical history and the family history were not remarkable

A general physical examination showed nothing abnormal in the head neck or thorax The examination of the abdomen showed a rather relaxed scar in the right upper quadrant There was also a small umbilical hernia A tentative diagnosis of chronic calculus cholecystitis was made and hospitalization recommended She entered the Massachusetts Women's Hos pital and further studies were not important On June 27, 1929 Dr Lahey removed a gallbladder which was found to be contracted and small with dense scarring The common duct was markedly dilated it was explored no evidence of stones could be found and a T tube was sutured in the duct A cig

arette drain was placed at the base of the liver, and carried out the lower angle of the wound with the T tube

The patient's postoperative convalescence was marked by a prolonged drainage of a purulent nature, a septic type of temperature, and leukocytosis Shortly after operation physical signs appeared at the base of the right lung posteriorly A diagnosis of postoperative pneumonia was made Three weeks after operation there was still evidence of consolidation, with bron

Fig 200—Roentgenogram (bedside) three weeks after cholecystectomy showing involvement of right lower lobe Note density in this area and obscuration of diaphragmatic shadow At the time this exposure was made a diagnosis of bronchopneumonia and pleural effusion was made although subsequently this lesion proved to be a subdiaphragmatic abscess with a lung reaction above

chial breathing and râles A bedside roentgenoscopical examination of the chest three weeks after operation showed a dense homogeneous shadow at the right base and obliteration of the costophrenic angle The position of the diaphragm could not be determined The roentgenological diagnosis was pneumonia and possibly pleural effusion (Fig 200) The leukocyte count at this time was 20,000 After a period of five weeks the temperature fluctuated less and there was an improvement in

the patient s condition Six weeks after operation a roentgeno
gram of the chest showed a clearing of the lung field but a
diaphragm on the right side (Fig 201) The patient left the
hospital at this time the temperature being normal and the
abdominal sinus still draining

The patient was not seen again until January 3 1930 four
and one half months after her discharge from the hospital
At this time the abdominal sinus was still discharging pus
freely For several weeks she had a chronic cough some pain
in the right lower chest anteriorly and a roentgenogram of the

Fig 201 —Roentgenogram s x weeks af er operat on show ng fa ly
clear lung fields and a h g h d aphragm on the r ght At th s t me there was
no cough no feve but a dra n g s nus n the upper angle of the abdom nal
wound Th s study clearly demonstrated that the bas c troub e was a sub
d aph agmat c abscess and not a pneumon a

chest at this time showed a possible old lung abscess of the right
base There was marked pleural thickening A roentgen
scopical examination of the gallbladder area after the sinus had
been injected with lipiodol showed a communication of the
abdominal sinus with the lung abscess above the diaphragm
and this area in turn communicating with the right lower main
bronchus In fact this roentgen study showed that the cath
eter inserted in the sinus had passed up through an opening in
the diaphragm and its tip was seen in the lung abscess cavity
(Figs 202 203) The patient was readmitted to the hospital

arette drain was placed at the base of the liver and carried out
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of green purulent material and that the incisional drainage had become less in amount The pain in her back was somewhat improved A repetition of the x ray study showed that there was less haze of the base of the right lung but still a definite cavity formation There was an excursion of the diaphragm on this side from 1 to 1½ inches during deep breathing

On March 10 1930 Dr R B Cattell exposed the right phrenic nerve under local anesthesia and evulsed 10 cm after a careful dissection of all branches of the nerve A very definite but gradual improvement was made and the patient was again

Fig 203 —Roentgenogram (lateral exposure) made six months after cholecystectomy with subdiaphragmatic abscess formation The shadow of a catheter and Lipiodol can be seen above the diaphragm in the lower lobe Note clearness of poster or costophrenic sinus

discharged from the hospital on the tenth day Following this last procedure the amount of drainage of the abdominal sinus gradually decreased the cough and expectoration disappeared entirely in one month and the abdominal fistula closed at the end of two months without the necessity of any other operative procedure There was a steady gain in weight and strength

She was seen a year later in March 1931 and at this time was symptom free had no cough or expectoration and a physical examination was negative except for the presence of a high diaphragm and a slight weakness in the abdominal wound

Dr E D Churchill saw the patient in consultation and felt that her condition was too poor to warrant an extensive operative procedure He also felt that any effort to cure her would involve removing a flap from the chest wall and either widely draining or removing the lower lobe of the lung The abdominal sinus was dilated by a daily change of catheters, increasing the size gradually and better drainage of the subdiaphragmatic area was obtained This gave the patient a good deal of relief both from her cough and from the pain and she was again discharged from the hospital improved

Fig 202—Roentgenogram (A P exposure) made six months after cholecystectomy A catheter had previously been inserted in the upper abdominal sinus and lipodol injected Note position of abscess cavity and the fact that there is a shadow from the lipodol which has found its way above the diaphragm as well as into the subdiaphragmatic cavea

The patient was next seen a month later on February 6 1930, she had definitely become worse after the catheter in the abdominal wound had slipped out It was reinserted and there was a marked amount of profuse purulent drainage A lipiodol injection at this time showed the cavity to be approximately the same size and in about the same position as was found a month previously

The patient returned on March 7 1930 with a history that a few days previously she had coughed up a large quantity

of green purulent material and that the incisional drainage had
become less in amount The pain in her back was somewhat
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Fig 20   Roentgenogram (A P exposure) made six months after
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fact that there is a shadow from the l p odol which has found its way above the
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Fig 203—Roentgenogram (lateral exposure) made six months after cholecystectomy with subdiaphragmatic abscess formation. The shadow of a catheter and lipiodol can be seen above the diaphragm in the lower lobe. Note clearness of posterior costophrenic sinus

discharged from the hospital on the tenth day. Following this last procedure the amount of drainage of the abdominal sinus gradually decreased, the cough and expectoration disappeared entirely in one month, and the abdominal fistula closed at the end of two months without the necessity of any other operative procedure. There was a steady gain in weight and strength.

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Fig 207 —Roentgenogram (A P exposure) made six months after cholecystectomy A catheter had previously been inserted in the upper abdominal sinus and lipiodol injected Note point on of abscess cavity and the fact that there is a shadow from the lipiodol which has found its way above the diaphragm as well as into the subdiaphragmat c area

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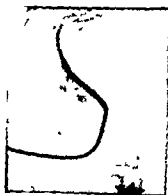charged from the hospital improved

F g 20 —Roentgenogram A P exposure) made six months after
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F g 70 —Roentgenogran A I exposure) made s x months after
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examination was negative except for the presence of a high
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An x ray of the chest made at this time showed the right dome of the diaphragm to be on the level with the third rib anteriorly and slightly higher than it was in the film made a year previous just after the phrenic exeresis On deep inspiration the diaphragm moved approximately 1 inch (Fig 204)

The patient was last seen in December 1931 at which time she was in good health and presented no respiratory or gastrointestinal symptoms Fluoroscopy of the chest revealed a persisting high diaphragm with no movement on quiet breathing and a paradoxical movement of 1 cm on forced breathing

F g 204 —Roentgenogram one yea after phren c nerve evuls on show ng clear lung field and pers st ng h gh d aphragm At th s t me pat ent was symptom free

Comment —In this patient we have represented one of the serious postoperative complications which is fortunately a very infrequent sequel of a gallbladder operation The course of events were as follows An operative procedure in the upper right quadrant a subdiaphragmatic abscess with an elevation of the diaphragm and a lung reaction above which was at first interpreted as being due to a postoperative pneumonia a failure of the physical signs in the chest to clear up and a protracted hospital course then a rupture through the diaphragm or an actual extension by continuity through the diaphragm into the

pulmonary tissue and finally the establishment of a communication with the lower lobe bronchus on the right side

The difficulties in the diagnosis between a primary basal pneumonia and a subdiaphragmatic abscess are well illustrated in this case There were physical signs of pneumonia as well as a roentgenographical shadow at the right base It is most likely that the subdiaphragmatic abscess occurred primarily, caused the lung reaction above or an actual inflammatory process by extension It is quite improbable that the reverse occurred *i e* a pneumonia a diaphragmatic pleurisy and a downward extension into the subdiaphragmatic space

It is difficult to say what proportion of the lung reaction above a subdiaphragmatic abscess is due to an actual pneumonic consolidation Restriction of movement of the diaphragm and lower intercostal muscles on the affected side would result in failure of aeration and atelectasis Also some of the haziness of this area may be vascular engorgement and edema Certainly the lung reaction in such cases does not always follow the same course that a broncho or a lobar pneumonia does However in this case there subsequently developed a definite area of destruction of the lung tissue

Collections in the upper abdomen are subjected to unusual mechanical influences The distance along a drainage tract from a position beneath or above the liver to the exterior is a long one The subatmospheric pressure which normally exists in the upper abdomen impedes the flow of fluid toward the surface The active contraction of the diaphragm and alterations in the position of the costal arch provide constant changes in the size of the upper abdomen and necessarily vary the pressure on the walls of an abscess cavity with each respiratory movement The walls of a granulating cavity in the pelvis or in soft parts elsewhere in the body, except within the thorax are subjected to the crowding in effect of surrounding tissues and this gradual external pressure from all sides facilitates greatly cavity obliteration When the abscess cavity is situated between two flat surfaces such as the diaphragm and liver an equal closing in on all sides of the cavity does not take place

An x ray of the chest made at this time showed the right dome of the diaphragm to be on the level with the third rib anteriorly and slightly higher than it was in the film made a year previously just after the phrenic exeresis On deep inspiration the diaphragm moved approximately 1 inch (Fig 204)

The patient was last seen in December 1931, at which time she was in good health and presented no respiratory or gastrointestinal symptoms Fluoroscopy of the chest revealed a persisting high diaphragm with no movement on quiet breathing and a paradoxical movement of 1 cm on forced breathing

F g 204—Roentgenogram one year after phren c nerve evuls on show ing clear lung field and pers st ng h gh diaphragm At th s t me pat ent was symptom free

Comment—In this patient we have represented one of the serious postoperative complications which is fortunately a very infrequent sequel of a gallbladder operation The course of events were as follows An operative procedure in the upper right quadrant a subdiaphragmatic abscess with an elevation ___ __ _ ____ irst ure ted

hospital course then a rupture through the diaphragm or an actual extension by continuity through the diaphragm into the

BLOOD TRANSFUSION REACTIONS

Clyde L. Wilson

During the year 1931 120 blood transfusions were given at the Lahey Clinic Of these there were 6 reactions (5 per cent) Three methods of transfusion were used Sixty were given by the indirect method using citrated blood 21 by the direct mul tiple syringe method (Lindeman) using whole blood and 39 by a direct transfusion apparatus (Drummond)

Generally speaking blood transfusion reactions are any un toward effects produced in the patient as a result of the intra venous administration of blood They may be immediate or delayed mild or severe Immediate reactions are those that occur during the transfusion usually the result of incompati bility Delayed reactions are those that occur some time after the transfusion has been given Urticaria sometimes follows transfusions but since this is an allergic condition and is always very mild and is not comparable with the more serious mani festations it is not listed among the reactions One patient who had attacks of asthma and was known to be sensitive to morphine developed urticaria following each of two transfusions This case is not included in the following series The reactions are tabulated in Chart I

CHART I

Method	Number	Reactions	Per Cent
Ind rect (citrated blood)	60	3	5 0
D rect n ult ple syr nge (whole blood)	21	0	0
D rect Drummond (whole blood)	39	3	7 6
Total	120	6	5 0

Of the reactions 3 were immediate and the transfusions were not completed 3 were delayed A short summary of the cases show ng reactions follows

All of these factors lead to the chronicity of a subdiaphragmatic abscess

After the extension of the abscess into the pulmonary tissue above the problem of cavity obliteration became more difficult Here again there is a constant change of pressure against the walls of the cavity with each respiratory act the failure of surrounding tissues to compress the area and a long and uncertain drainage tract either by way of the abdominal sinus or up through the lower lobe bronchus

The patient was given nine months in which to heal the lesion spontaneously The fact that the symptoms of the lung abscess disappeared so rapidly and that the abdominal sinus healed after phrenic paralysis so soon is ample proof that this procedure was instrumental in establishing a cure Not only did the immobility of the diaphragm aid the healing process but its high position after paralysis caused a reduction in the size of the thorax and principally of the diseased lobe This permitted the walls of the multiple cavities and of the broncho abdominal fistula to come together and finally become obliterated

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Of the reactions 3 were immediate and the transfusions were not completed. 3 were delayed. A short summary of the cases showing reactions follows

Case I—The patient was a middle aged woman with a complete common duct obstruction. Her blood was in Group II. Four transfusions were given with no reactions. Following her fifth transfusion after she had been returned to her bed she had a chill and an elevation of temperature to 101.2 F. The transfusion was given by the Drummond method and the donor's blood was compatible by direct matching with that of the patient.

Case II—The patient was a middle aged man with a secondary anemia following a subtotal gastric resection for carcinoma of the stomach. Blood typing placed him in Group II. Immediately following his operation he was given a transfusion and no reaction occurred. A second transfusion was given twenty-one days later with 500 cc of blood being transferred by the Drummond method from a donor compatible by direct matching. On being returned to his bed he had a severe chill and an elevation of temperature to 10? F.

Case III—The patient a middle aged woman was in shock following a hysterectomy for uterine fibroids. The patient and donor were in Group IV and their bloods were compatible by cross matching. Five hundred cc of whole blood were given by the Drummond method. On being returned to her bed she had a chill and an elevation of temperature to 10? F.

Case IV—The patient was a young man with a secondary anemia following a severe hemorrhage from a gastric ulcer. He was in Group IV. The donor's cells were matched with the patient's serum by an intern and declared compatible. After about 10 cc of citrated blood had been given by the indirect method the patient complained of pain in the chest and back and his blood pressure began to fall. The transfusion was

compatible. The transfusion was then done without incident.

Case V—This patient had ulcerative colitis and secondary
anemia The donor was in Group IV and his blood was thought
to be compatible by cross matching After about 180 cc of
citrated blood had been given by the indirect method the
patient had a chill and complained of pain in the lumbar region
of her back and difficulty in breathing The transfusion was
stopped and glucose was given intravenously following which she
recovered from the acute reaction The donor's cells were then
matched with the patient's serum and found to be incom
patible

Case VI—The patient was a fifty five year old woman with
a carcinoma of the pancreas and secondary anema The patient
was in Group II and the donor in Group IV Their bloods
were compatible by cross matching After 400 cc of citrated
blood had been given by the indirect method a flush was noticed
upon the patient's face The transfusion was stopped immedi
ately Immediately thereafter the patient complained of con
gestion in the head tightness in the chest pain in the region of
her kidneys and nausea A moment later she vomited Her
pulse rate began to increase and her blood pressure began to
fall Adrenalin was given intravenously and this was followed
by 10 per cent glucose More adrenalin was given subcuta
neously the area of injection being massaged from time to time
Ten minutes after the beginning of the reaction stertorous
breathing began and the patient became unconscious At this
time all reflexes were hyperactive but not more on one side
than on the other The intravenous administration of glucose
was stopped the patient taken out of shock position and placed
in bed One hundred twenty cc of 50 per cent magnesium sul
phate solution was given by rectum Ten minutes later she
regained consciousness respirations became normal and her
blood pressure which had previously been 140/80, was found to
be 70/35 She was able to talk freely, stating that she had some
tightness in her chest and felt slightly suffocated The patient
was returned to shock position and a hypodermoclysis was
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Case V —This patient had ulcerative colitis and secondary anemia The donor was in Group IV and his blood was thought to be compatible by cross matching After about 180 cc of citrated blood had been given by the indirect method the patient had a chill and complained of pain in the lumbar region of her back and difficulty in breathing The transfusion was stopped and glucose was given intravenously following which she recovered from the acute reaction The donor s cells were then matched with the patient s serum and found to be incom patible

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Case VII—The following is the report of a severe reaction from a blood transfusion given at this clinic in 1930. It is not included in the above series of cases and is mentioned because of the important conditions it demonstrates.

The patient was a twenty year old girl with chronic ulcerative colitis and secondary anemia. Citrated blood was started into the cubital vein of the patient when almost instantly she became restless and complained of faintness. A splotchy rash appeared about the patient's neck. The transfusion was stopped at once. The faintness and weakness increased and about thirty seconds later she complained of sharp pains in both loins and back. This was followed immediately by a sensation of pressure in the chest. Two minims of adrenalin were given subcutaneously, the area of injection being massaged at once. This was soon followed by the disappearance of the rash about the neck, the rash having been present only about two minutes. The faintness persisted but she did not lose consciousness. The pulse rate reached 140 and remained regular. The pain in the back and feeling of pressure in the chest persisted for about ten minutes. Leaving the citrated blood clamped off a direct matching was done, the bloods being found incompatible. The transfusion was discontinued and it was estimated that the patient had received between 10 and 20 cc of blood. No change could be seen in the large blood come former. The donor's blood was again typed and proved to be in Group IV showing no agglutination in thirty minutes. Three days later a second transfusion was given using citrated blood from a Group IV donor compatible by direct matching. There was no reaction following the transfusion.

DISCUSSION

At this clinic the Moss classification of blood groups is used. The donors and recipients are grouped and whenever possible a donor of the same group as that of the patient is used. Their bloods are cross matched by making a sealed hanging drop preparation of 1 drop of a suspension of the donor's cells in normal saline with a drop of the patient's serum and on another

slide a drop of a suspension of the patient's cells in normal saline with a drop of the donor's serum. These mixtures are incubated and examined every ten minutes for thirty minutes. If no agglutination has occurred during that time the bloods are considered compatible. Earlier in the year, 'direct matching was frequently done. This consisted in mixing upon a glass slide, 2 drops of the patient's serum and 1 drop of the donor's blood. The slide was rotated constantly for two to three minutes and examined macroscopically for clumping. If none occurred in thirty minutes the bloods were considered compatible. This method is no longer used.

While the series of blood transfusion is much too small to permit drawing many conclusions, several things are indicated. The reactions in Cases IV and V were due to errors in technic in examining the bloods prior to the transfusion. Cases V and VII illustrate the danger of using the so called "universal donor" without previously cross matching the bloods of the donor and recipient.

PRIMARY ANEMIA IN RELATION TO SURGICAL DIAGNOSIS

LEWIS M. HURXTHAL

PRIMARY anemia with its various manifestations may suggest certain clinical conditions of interest to the surgeon as well as the internist. The first case to be presented is one which was thought to be cancer of the stomach. This diagnosis had been made twice before coming to the clinic, when I first examined the patient I was of the same opinion.

Case I—Mr C L of Nordic stock, fifty years of age, stated that he had noticed some nausea off and on for three years. During the past six months he had had no appetite and during this time he had lost 22 pounds in weight. On two or three occasions he had vomited greenish material. Five months before entry he had had x rays of his stomach which were reported as negative. One month before entry he had consulted another physician who had confirmed the suspicions of the first physician and informed the family that the patient had cancer of the stomach. There were no paresthesias and he had not noticed a sore tongue. On physical examination, the patient was very pale with slight lemon tint to the skin. He was thin and so weak that he could hardly stand. The tongue showed no atrophic changes. In the epigastrium could be palpated a definite mass which was first thought to be a tumor. Examination of the blood smear, however, showed a typical picture of pernicious anemia. Fluoroscopical examination of the stomach showed no evidence of tumor. It was low and long and the peristaltic rate was sluggish. The greater curvature was pressed upon by what the roentgenologist interpreted to be the colon. This was later proved to be the spleen which for some reason

branes the question of anemia not suggesting itself There was definite clinical jaundice the pale lemon color so commonly seen with severe anemia was not present Reflexes were absent

Sensation was reduced in the lower limbs

On admission to the hospital blood studies revealed the following Red blood cells 1 610 000 white blood cells 7400, hemoglobin 60 per cent Wassermann negative Gastric analysis No free HCl Bilirubin 1 Reticulated cells less than 1 per cent Smear Typical blood of primary anemia Fluoroscopical examination of the stomach revealed nothing abnormal The colon was smooth and large

Following the gastro intestinal x rays she was unable to get rid of the barium in her colon As a last resort rectal dilatation was done under gas following which no further difficulty appeared Liver treatment was begun and from then on her progress was rapid her bowel function became normal and sensation returned although there remained some feeling of numbness in both hands and feet Five weeks after institution of liver therapy her red count had reached 4 200 000 She gained 5 pounds in weight and felt much stronger Her appetite was excellent nausea and vomiting had not been experienced

This case shows gastro intestinal symptoms which could be and were interpreted as gallbladder disease Two other recent cases gave almost identical histories The gallbladders after intravenous dye did not fill well and were interpreted as pathologic Liver therapy however relieved all symptoms related to the gastro intestinal tract One patient was a man of sixty six whose history dated back ten months while the other patient was a woman of seventy four with a three year history Both had red counts of below two million and as is frequently found in these cases their clinical appearance was misleading from the point of view of anemia

There are other clinical conditions which pernicious anemia may simulate on gross physical examination Recently we had a patient referred to us because of paralysis following spinal anesthesia The patient had been quite pale and this had been thought due to hemorrhoids consequently a hemorrhoidec

projected more toward the m dline giving the impression of a tumor there   Palpation along the lower costal margin did not reveal the edge of the spleen where it is customarily felt

The blood analysis was as follows   Red blood cells 1 620 000 white blood cells 6150   hemoglobin   40 per cent (Sahli)   bilirubin   0 9 (monophasic)   Wassermann negative   reticulated cells less than 1 per cent   Gastric analysis   Free HCl 0 cc   Total acid 6 6 cc   Smear revealed marked anisocytosis poikilocytosis microcytosis and macrocytosis   The cells were well filled with hemoglobin   The platelets were large and diminished in number

On a pound of liver usually raw the patient showed the typical reticulated red cell response reaching 25 per cent on the sixth day   His clinical improvement was rapid and his weight increased until he had recovered all he had lost   His red count when last seen was 5 600 000   He had maintained this on 4 to 5 pounds of liver per week   The spleen was no longer palpable

In some cases the increased blood pigments in the blood plasma and skin give the clinical impression of real jaundice Such was true in the following patient who underwent an operation for gallbladder disease elsewhere and was referred to us for common duct stricture or common duct stone

Case II—Mrs F C fifty nine years of age had suffered from right upper quadrant pain and bloating of some months duration   It is interesting that the pain had radiated to the back between the shoulder blades   Operation was performed eleven months before admission for gallstones   The gallbladder contained no stones   The gallbladder wall was reported as thickened   No bile drained after operation   Following this the patient never regained good health   vomited frequently   One month before admission she developed jaundice   This was the history as first obtained   Later it was revealed that she had noted numbness of the fingers and toes and had noted some incoordination when using her fingers   Constipation had been marked   Physical examination showed an obese woman weighing 177 pounds   There was color in her cheeks and mucous mem

PREOPERATIVE NARCOSIS

Lincoln F. Sise

The preoperative medication of patients has been a perplexing problem to solve. This is due to the fact that there is a great variation in the effect which a given dosage produces in different individuals and also to the fact that there is considerable variation of opinion as to what effect it is desirable to get. There has been some conflict of opinion between surgeons, anesthetists, and medical men as to what constitutes the most desirable effect in certain individuals.

Preoperative narcosis has two chief advantages. It relieves to a variable degree nervousness apprehension and worry on the part of the patient and it assumes something of the burden of anesthesia. The first advantage is most conspicuous during regional and spinal anesthesia. While some patients dislike to give up and become unconscious undoubtedly the majority wish to know as little as possible about the operative procedure. From their point of view the best narcosis is a complete narcosis, one in which they go to sleep in bed before the operation has begun and from which they awake after the whole procedure has been completed. This is most desirable in regional and spinal anesthesia. An abdominal operation under these anesthetics is especially unpleasant. Here, beside the ordinary noises such as the click of forceps and the snap of scissors there is the gurgle of intestines and the noise of suction apparatus. Moreover, the patient is subjected to various unpleasant sensations due to reflexes from the field of operation, such as nausea and vomiting and a "gone sensation" of extreme weakness due to fall in blood pressure following traction or hemorrhage. Many patients are greatly disturbed, especially in a teaching clinic,

tomy was performed Spinal anesthesia precipitated the neurological change in the spinal cord evidence of which was present before operation but apparently misinterpreted This point is worth emphasis for spinal anesthesia may be harmful to others with this disease as it appeared to be in her case By the use of intramuscular liver extract (Lilly) given daily considerable improvement has been effected Because of periodic loss of bladder control and the development of cystitis it will be difficult to control this case, and it is doubtful if permanent bladder control will return

The occurrence of pernicious anemia in toxic and nontoxic goiter is occasionally seen Occasionally in pernicious anemia the basal metabolic rate may be elevated and if the anemia is severe enough some tachycardia may result When pernicious anemia is associated with exophthalmic goiter it is important to get the blood count well up before operation In one patient who had exophthalmic goiter primary anemia and congestive heart failure it was necessary to resort to transfusion The edema increased rapidly despite Lugol's solution and digitalis and it did not seem justifiable to wait for the liver response Transfusion turned the tide a prompt diuresis began and from then on recovery was prompt

It is well to remember that the hemoglobin estimation is the true index of oxygen carrying power and if this is well up surgery is safe regardless of the red cell count Not infrequently one may find a 70 or 80 per cent hemoglobin with a red count of two or three million The latter impresses one more than the hemoglobin yet it is the former that really counts

Thus the clinical symptoms of primary anemia are suggestive of all sorts of clinical pictures One should keep the possibility of the disease always in mind when dealing with certain surgical problems

Our medical department believes that the barbiturates interfere with the proper excretion of the kidney and in some instances have been responsible in highly susceptible individuals for precipitating postoperative uremia

In our use of preoperative narcosis we have gone through several stages. In our ether cases before using much spinal anesthesia we used moderate doses of morphine and atropine usually about $\frac{1}{4}$ grain of morphine and 1/200 grain of atropine. On coming to use more spinal anesthesia we continued the same dosage and substituted scopolamine for the atropine. The sedation produced by this was quite mild and many patients complained bitterly of the mental ordeal experienced especially during abdominal operations. The size of the dose was therefore gradually increased. To our surprise as the amount of narcosis was increased the amount of nausea and vomiting experienced during the operation under spinal anesthesia decreased but if much morphine was employed the test of skin sensation to determine the height of the spinal anesthesia proved difficult or impossible. Nausea and vomiting though infrequent during the operation were apt to reappear after operation as the patient emerged from the narcosis. Sedation composed largely of a barbiturate was then tried. This was an improvement in that skin sensation was readily tested for and nausea and vomiting greatly reduced but patients were apt to be restless and uncooperative in a condition described above as second stage. We then found that by using a combination of these two procedures a middle course could usually be steered which avoided most of the difficulties that is if too large a proportion of a barbiturate or scopolamine or both was used in proportion to the morphine the patient was often restless and uncooperative and if too large a proportion of morphine was used it was difficult to test skin sensation and there was postoperative vomiting but if the right proportion between the two was used most of these difficulties were avoided

We now therefore use a combination of these three drugs in varying amounts and proportion such as appear suitable for meeting the varying conditions and for the same anesthetic vary

by the talk of the surgeon explaining to his audience the steps of his operation and commenting on the pathology disclosed

Preoperative narcosis helps in the management of the anesthetic itself where it is a general anesthetic because it reduces the amount of the anesthetic necessary This effect is important only where large amounts of narcosis are employed such as where avertin is used Thus it is apparent that there is no really sharp dividing line between preoperative narcosis and basal anesthesia

In contrast to these advantages there are some well marked disadvantages to the use of this narcosis It is difficult to get just the effect desired The same dosage in different individuals of apparently the same general resistance may produce widely varying effects In general there may be said to be three stages to the effect produced as the dosage is increased In the first stage there is mild sedation The patient is conscious but is quiet and less apprehensive In the second stage the patient may or may not be conscious or amnesic but in either event he loses a certain amount of nervous control and coordination He may give way to his fear or be simply uncooperative He is often difficult to manage In the third stage the patient is deeply narcotized He is quiet relaxed usually unconscious or at least amnesic The first or third stages are aimed at as the second is undesirable especially if spinal or regional anesthesia is used But the variation in the effect of a given dosage occasionally lands the patient in the second stage The problem is less difficult with general anesthesia as patients even in the second stage of narcosis usually do well after the general anesthetic is started It is simply a question of their mental state prior to starting the anesthetic

Another objection to preoperative narcosis is its depressing effect on the aged the weak and the poor risk generally This is especially important with spinal anesthesia Here we already have the depressing effect of spinal anesthesia perhaps with depressing reflexes from the field of operation possible even going on to some degree of shock It is unwise to add to these the depressing effect of much preoperative narcosis

ceive 5 grains of soluble barbital and as much morphine and sco polamine as it is thought that they will tolerate well This will usually be morphine $\frac{1}{4}$ grain and scopolamine 1/150 grain though considerably more might be used with the strong and vigorous With the weak the dose is reduced, but not as sharply as with spinal anesthesia, $\frac{1}{6}$ grain of morphine and 1/300 grain of scopolamine being tolerated well by most such patients

A medium sized dose of avertin just enough to put the pa tient soundly asleep makes an excellent preoperative prepara tion for regional anesthesia The dosage would be approximately 50 to 80 mg of avertin per kilo of body weight Avertin has the advantage of having a protective influence against the toxic effects of the local anesthetic drugs similar to that of the bar biturates while the easy induction and complete unconscious ness are a great boon to the patient The combination of avertin and successful regional anesthesia is highly satisfactory

With inhalation anesthesia the problem is much simpler Before nitrous oxide comparatively heavy doses of narcotics are well tolerated They are not only a help to the patient in lessening apprehension, but are a decided help in the anesthesia itself Here good sized doses are of material assistance by as suming some of the burden of the anesthesia, and thus helping produce deeper anesthesia and enabling more oxygen to be used Thus 3 or $4\frac{1}{2}$ grains of sodium pentobarbital with $\frac{1}{4}$ or $\frac{1}{3}$ grain of morphine and 1/100 or 1/75 of scopolamine would be a fair sized dose This should be reduced considerably for the weak to perhaps pentobarbital 3 grains and morphine $\frac{1}{6}$ grain, and scopolamine, 1/300 grain

Basal anesthesia with avertin, 60 to 100 mg per kilo of body weight, makes an excellent preparation for nitrous oxide Anes thesia is deeper and the use of more oxygen is possible For many cases this combination makes a splendid anesthesia In duction is easy, moderate depth and relaxation are possible, there is considerable flexibility, and a high degree of safety

Before ethylene anesthesia considerably smaller doses are in order Ethylene is a much more powerful anesthetic than is nitrous oxide so that less help is needed in order to be able to

dosage widely to suit different patients   Thus the nervous and apprehensive who are at the same time strong and vigorous receive a heavy dose while the aged and weak—even though nervous and apprehensive—always receive a small dose   We believe that the depressing effect of preoperative narcosis in these patients is important and that they should not be handicapped by this extra burden   They are easily controlled under inhalation anesthesia even without appreciable narcosis   While moderate narcosis is permissible with regional anesthesia it seems wiser with spinal anesthesia to use a light gas anesthesia if necessary where the patient is nervous and uncomfortable rather than to depend on the narcosis   In the past there has been some objection to such gas anesthesia because it induced exaggerated respiration which interfered with the surgeon's work in the abdomen   But with the present method of carbon dioxide removal explained elsewhere in this issue and the quiet respiration which is thus made possible with gas anesthesia this objection is largely removed

For spinal anesthesia the average proceeding for a middle aged patient would be 6 grains of sodium amytal or 3 grains of sodium pentobarbital by mouth with $\frac{1}{6}$ grain of morphine and 1 300 grain of scopolamine or simply with $\frac{1}{4}$ grain of morphine subcutaneously   These doses are decreased sharply for the poor risk to perhaps $\frac{1}{8}$ grain of morphine alone and are increased slightly for the vigorous

Before regional anesthesia the barbiturates assume a special importance because of their protective action against the toxic effects of drugs of the cocaine-novocaine series   A large dose of a barbiturate however without much morphine appears to increase the sensitivity of the patient to painful stimuli   When this protective action of the barbiturates first came to notice rather large doses were used and it was found that the results of regional anesthesia were distinctly less satisfactory   We have therefore reduced the dose of the barbiturate at the same time increasing the dose of morphine and have found results much better   These patients usually tolerate well good sized doses of morphine and scopolamine   Our patients usually re

THE CONTROL OF BLOOD PRESSURE IN SPINAL ANESTHESIA

Lincoln F. Sise

ANESTHETISTS are not agreed on the attitude which should be taken toward the fall in blood pressure which occurs during spinal anesthesia. Most writers have felt that some effort should be made to maintain the blood pressure, or at least to prevent too great a fall. One school however, feels not only that the fall in blood pressure is not injurious but that certain of the measures commonly taken to prevent it are themselves injurious, and that the only measure necessary or permissible (beyond some mild stimulation) is the Trendelenburg position.[2] Emphasis is placed on the harmfulness of the vasoconstrictor drugs. It is felt that if enough pressor action is obtained to produce a worth while effect on the blood pressure the vasoconstriction in the region of the vital centers will be such that less blood will be brought to them than if no medication had been given. One writer believes that with ephedrine (and by inference, with epinephrine) a rise of pulse rate occurs which is out of proportion to that of the blood pressure so that the pulse blood pressure ratio is less favorable than without the drug. He also goes a step beyond the vasoconstrictor drugs and criticizes the use of fluids.[3]

Those who disapprove of the use of vasoconstrictor drugs base their attitude apparently entirely on the premise that the fall of blood pressure in spinal anesthesia is caused by its vasodilating action, with consequent pooling of blood, especially in the splanchnic region. We believe that the problem of the fall in blood pressure is not as simple as this and that the last word on this question has not yet been said.

give the patient a reasonable amount of oxygen This gas is explosive when mixed with much over 30 per cent oxygen the exact amount varying with conditions Consequently it is unwise to give an amount of preoperative narcosis which will make it necessary to give more than this amount of oxygen in order to keep the patient from being too deep Sodium pentobarbital 1½ to 3 grains with morphine ⅜ grain and scopolamine 1 300 grain is ample for most patients Somewhat more may be given to the vigorous and as little as ¼ grain of morphine alone to the weak

There is little need for much narcosis before ether One-sixth grain of morphine will help the patient before anesthesia and is usually ample Except in quite vigorous subjects more than this amount may so depress the respiration as to make ready control of the pati͟   re difficult Enough atropine to control secretion is very h   1 1/200 grain is usually enough for the average adult of r͟   More than this will often give distressing dryness of t͟   The ͟   need less and the youthful proportionately͟   child of   l tolerate the same dose as the person͟   ͟͟ 1

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region of the vital centers will be such that less blood will be
brought to them than if no medication had been given One
writer believes that with ephedrine (and by inference with
epinephrine) a rise of pulse rate occurs which is out of proportion
to that of the blood pressure so that the pulse blood pressure
ratio is less favorable than without the drug He also goes a
step beyond the vasoconstrictor drugs and criticizes the use of
fluids [3]

Those who disapprove of the use of vasoconstrictor drugs
base their attitude apparently entirely on the premise that the
fall of blood pressure in spinal anesthesia is caused by its vaso-
dilating action with consequent pooling of blood, especially in

It is becoming increasingly evident that there is another factor or other factors, at work in addition to vasodilation For some years it has been known that root block of the splanchnic area such as occurs in spinal anesthesia if confined entirely to the splanchnic area causes but a slight fall in blood pressure This was clearly pointed out by Bower in 1926 [1] and has been confirmed by various observers since If however, a similar block is placed above the fifth thoracic segment, and is prevented from reaching the splanchnic area a marked fall in blood pressure occurs The exact mechanism of this fall is not clear, but certainly it cannot be due to splanchnic dilatation

There is evidence that there is some vasodilation throughout the body in regions apparently not directly affected by the block

Absorption from the spinal canal is very rapid When a drug is used such as novocaine with which considerable concentration is necessary the systemic effects of the drug probably play a part in the fall of blood pressure though perhaps not a very large one [*]

It is probable that anoxemia plays a very important part in the production of the fall in blood pressure [*] That cell anoxemia is important will probably be admitted by all but that deficient oxygenation of the blood is very important in spinal anesthesia may not be so readily agreed upon It has however been shown experimentally that animals may be completely paralyzed by overwhelming doses of novocaine given intraspinally and yet that they will suffer a great fall in blood pressure only with the advent of anoxemia [1] [4] If anoxemia is prevented by properly applied artificial respiration they can be kept alive for hours without marked fall in blood pressure One such animal was kept alive by artificial respiration for ten hours and at the end of that time was able to resume respiration himself I was unfortunate enough myself on one occasion to have the opportunity of demonstrating in the human being the value of artificial respiration in complete respiratory paralysis from spinal anes-

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[*] Since the above was written S J G Nowak of the Boston City Hospital has shown that in novocaine spinal anesthesia there is a parallelism between the fall in blood pressure and the excretion of novocaine in the urine

thesia On this occasion (and, I am happy to say, on this occasion only) in an endeavor to get a long anesthesia for a high abdominal operation, I succeeded in getting paralysis not only of all the intercostal muscles but of the diaphragm as well At the height of the paralysis not a vestige of voluntary respiration could be observed, and without treatment the patient would, of course have suffered a fatal fall in blood pressure Yet she was carried through very easily by means of artificial respiration with a face mask and a bag of oxygen, and no other treatment The fall in blood pressure was slight, the operation proceeded without interruption, the respiration was resumed in about half an hour, and convalescence was smooth and uneventful These experiments and this incident indicate the great importance of proper oxygenation of the blood in the maintenance of blood pressure

While all of the above may not make clear the exact mechanism of the fall in blood pressure, it does show that there are other factors in its production besides splanchnic vasodilation In fact some observers now feel that the role played by splanchnic dilation is a minor one

Our attitude toward maintaining blood pressure during spinal anesthesia was originally taken purely on clinical evidence —a comparison in our minds between patients untreated and those given ephedrine and other measures to maintain blood pressure Experimental evidence seems to be such as to confirm us in this view We, therefore, feel justified in continuing with our present attitude We continue to feel that it is desirable to hold the blood pressure preferably at some point between normal and two thirds normal Details of the method need not be discussed here They have been published on several occasions one being in these clinics two years ago[4] But a few aspects of the situation will be mentioned

We now select patients for spinal anesthesia on a somewhat stricter basis than formerly Formerly we rejected only those in whom we felt there was serious risk of fatality We find, however, that there are certain patients who, though surviving the immediate effects of anesthesia and operation, enter the post

operative period in such poor condition that convalescence is stormy and that they may eventually succumb These patients are usually of the weak elderly sclerotic and hypertensive type They are frequently the subjects of malignancy and require extensive operative procedures The blood pressure once lowered comes back only with the greatest difficulty They tolerate well only a very low spinal anesthesia and are hard hit by the high ones Therefore with this type of patient where the operation is an upper abdominal one and especially if it will be prolonged some other form of anesthesia is preferred usually gas and field block

Out attitude toward the pressor drugs ephedrine and epinephrine is practically unchanged That their action in large doses is harmful is generally admitted but constitutes no reason for denying their value in small doses

Ephedrine shows distinct reverse action in that small doses stimulate while large doses depress the heart It is of value in maintaining blood pressure but of little value or even harmful when the blood pressure is once lowered Epinephrine should therefore be used here We have decreased somewhat the dose of ephedrine which we consider a safe maximum and now feel that 50 mg should rarely be exceeded This drug does as Saklad pointed out increase the pulse rate but as the pulse rate in spinal anesthesia is frequently abnormally low the increased rate is often an advantage If the dose is regulated with judgment a harmful rise in pulse rate is seldom seen

Epinephrine seems to us the best circulatory stimulant for use during the operation as opposed to prophylaxis before anesthesia as with ephedrine Epinephrine is a normal stimulant to the vascular system and its action is rapid and powerful The pulse rate is usually turned toward normal The common effect is for the pulse to fall as the blood pressure rises Occasionally an abnormally slow pulse is increased in rate Great care should be used to avoid overstimulation This can best be accomplished we believe by means of small repeated doses given subcutaneously or intramuscularly early before there has been any great fall in blood pressure

We still believe fluids to be of value both in the prophylaxis and the treatment of vascular depression. Of late we have used transfusion somewhat more frequently where some anemia has existed. In a few instances two transfusions have been used in connection with operation on one patient. Such patients have been elderly ones in poor condition and requiring extensive operations for malignancy. The procedure has been to give a transfusion the afternoon before operation salt solution and glucose in the morning immediately before operation and another transfusion immediately after operation. We have lately avoided doing transfusion immediately before operation because of the possibility (even though remote) of a slight transfusion reaction coming at the same time as vascular depression from the anesthesia. It has seemed to us that these two transfusions carried through these patients in surprisingly good condition. In the few cases where this double transfusion has been done we have been immensely pleased with the results.

Labat has done a service for spinal anesthesia by calling repeated and emphatic attention to the value of the Trendelenburg position. We agree heartily with his views in this respect. We wish to call attention again however to the danger of high Trendelenburg with obese patients who have large masses of abdominal fat. With these patients such a position may induce rapid and severe collapse apparently because of respiratory difficulty and anoxemia. A similar but far greater danger exists in the Bure position.

We have been increasingly impressed with the importance of the role which the respiratory factor plays in producing the fall in blood pressure. Some idea of its importance was given in the early part of this paper. The anesthetist should always have at hand oxygen and means for giving it instantly and efficiently by artificial respiration. As in other means of treatment however its value is probably greater as prophylaxis than as treatment.

SUMMARY

Every attempt should be made to keep the blood pressure of patients undergoing spinal anesthesia at some point between

normal and two-thirds normal The complete mechanism of the fall in blood pressure is not entirely understood This fall is probably due to a number of different factors and may be treated from a number of different angles The pressor drugs are a two-edged sword being of great value when properly used but otherwise capable of considerable harm Fluids, especially transfusion oxygen and the Trendelenburg position each are of importance

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POSTOPERATIVE PULMONARY COMPLICATIONS A COMPARISON OF THE EFFECT OF SPINAL AND OF ETHER ANESTHESIA

LINCOLN F SISE

WRITERS in the past have stressed the lack of effect which spinal anesthesia had on the vital organs of the body Until recently they felt that this lack of effect upon the lungs made it especially valuable when pulmonary complications might be anticipated and that in general it made postoperative pulmonary complications less probable as compared with ether This view seems reasonable since ether irritates the respiratory tract increases the secretions and abolishes the reflexes of the glottis Of late however the pendulum has swung somewhat the other way and there has been a tendency to feel that the comparison is less favorable to spinal anesthesia and that it might even have a tendency to increase pulmonary complications The use of spinal anesthesia has probably been limited of late because of this fear

This attitude may have been accentuated or even caused by a report of McKittrick McClure and Sweet [3] on spinal anesthesia giving a comparison of the postoperative pulmonary complications under spinal and under ether anesthesia (Table 1)

At the Massachusetts General Hospital where these statistics originated cases are admitted to the East and to the West Surgical Services alternately as far as possible The presumption, therefore is that the number and character of the cases on these two services is approximately the same During the first year of the report 1927 to 1928 ether was used mostly on both services During the second year this procedure was continued on the West Surgical Service, but spinal anesthesia was used largely on the East Surgical Service The results indicate a

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TABLE 2

MISCELLANEOUS REPORTS NO SIGNIFICANT RESULTS

Ether

	Cases	P C	Per cent
Brunn and Brill	42	5	11 9
Foss and Kupp[5]	400	7	1 7
Total	442	12	2 7

Spinal

	Cases	P C	Per cent
Brunn and Brill[2]	281	24	8 5
Foss and Kupp[6]	400	7	1 7
Johnson[7]	250	0	0
Thompson[11]	250	0	0
Total	1181	31	2 6

surface In the above table it is noticeable that there is a wide variation in the individual results so wide in fact that it seems a matter of chance that the end results in the two anesthetics are so nearly the same These variations suggest the possibility of a wide margin of error through the inclusion of some outside factor which influences the results

This outside factor may well be a variation in the type of operation It has been universally recognized that the type of operation is the predominant factor in the production of postoperative pulmonary complications Elwyn,[3] whose figures have been widely quoted gives the pulmonary complications following various operations as follows Extremities 0 75 per cent, appendix 3 2 per cent and stomach 14 2 per cent Others have published similar results Where one series of figures includes many stomach operations and few on the extremities, and an other includes many extremity operations and few on the stomach the first series will have a much higher incidence of postoperative pulmonary complications than the second, simply because of the difference in the types of operation and entirely independent of the anesthetic used

To make a fair comparison, therefore, the type of operation should be approximately the same under each anesthetic With

TABLE 1

McKittrick[9] Report Marked Increase in Pulmonary Complications After Spinal Anesthesia

	East Surgical Service			West Surgical Service (ether mostly used)	
	1927 1928	(Sp nal year) 1928–1929		1927 19 8	1928–1929
Pneumon a	22	29		28	22
Mass ve collapse	15	5		7	4
Pulmonary embolus	0	5		7	4
Bronchitis	0	11		0	3
Pleur sy	1	2		1	1
Upper resp ratory infection	1	1		3	3
	39	33		46	37

considerable increase of pulmonary complications under spinal anesthesia While the pulmonary complications decreased by nine on the service which continued the use of ether they in creased by fourteen on the service which shifted to spinal anesthesia

Such a marked increase under spinal anesthesia seems illogical and not in accord with theoretical considerations Neither is it in accord with our clinical impression of our results at the Lahey Clinic To clarify the situation therefore, it seemed advisable to make an investigation to determine if possible, whether the results of others agreed with those of McKittrick et al or whether his results were an isolated instance, due perhaps to some special condition

I have, therefore gone over current medical literature and over our own records for the last two complete years 1929 and 1930

Table 2 is a compilation of a series of miscellaneous operations under the two anesthetics The variation in the final result is not enough to be significant Certainly no significant increase is shown under spinal anesthesia

Great care is necessary in the interpretation of statistics They may easily be distorted by some factor not evident on the

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To make a fair comparison therefore the type of operation should be approximately the same under each anesthetic With

this in mind I have arbitrarily chosen to compare abdominal operations as the most fertile field for pulmonary complications and have divided them into upper abdominal operations and lower abdominal operations

TABLE 3

UPPER ABDOMINAL OPERATIONS MORE THAN TWICE AS MANY PULMONARY COMPLICATIONS AFTER ETHER AS AFTER SPINAL ANESTHESIA

	Spinal anesthesia alone or with gases			Ether alone or as reinforcement.		
	Cases	P C	Per cent	Cases	P C	Per cent
Lahey Clinic	261	15	5 7	195	17	8 7
Knight[2]	18	1	5 6	122	17	13 9
Ferguson and North[3]	75	2	2 7			
Graham[4]	75	2	2 7	25	6	8 0
Berard[5]	98	2	2 0	19	4	21 0
Totals	527	22	4 2	411	44	10

It is impossible to get a series of figures which is ideally fair Not many suitable figures have been published Those available are shown in Tables 3 and 4 The Lahey Clinic figures

TABLE 4

LOWER ABDOMINAL OPERATIONS No SIGNIFICANT RESULTS

	Spinal anesthesia alone or with gases			Ether alone or as reinforcement.		
	Cases	P C	Per cent	Cases.	P C	Per cent.
Lahey Clinic	464	12	2 6	424	8	1 9
Knight[2]	17	0	0	138	5	3 6
Totals	481	12	2 5	56	13	2 3

comprise spinal anesthesia cases for years 1929 to 1930 and ether cases for the years 1924 to 1925 previously published [15] This is not an ideal comparison as the incidence of pulmonary com

plications varies somewhat with different seasons   Another factor complicates the picture still more   The upper abdominal operations under spinal anesthesia in 1929 and 1930 all had inhalations of carbon dioxide after operation as prophylaxis against pulmonary complications, while the ether cases in 1924 and 1925 did not have   None of the lower abdominal operations had these inhalations   That a favorable effect of these inhalations in upper abdominal operations under spinal anesthesia was not responsible for the favorable comparison for spinal anesthesia in the final figures is shown by the fact that the comparison is tween the two anesthetics is less favorable to spinal anesthesia in the Lahey Clinic figures than in any of the others   The series reported by Bérard are all gastric operations   The combined

TABLE 5

SUMMARY OF TABLES 3 AND 4

	Spinal anesthesia alone or with cases			Ether alone or as reinforcement		
	Cases	P C	Per cent	Cases	P C	Per cent
Upper abdominal	527	22	4 2	411	44	10 7
Lower abdominal	481	12	2 5	562	13	2 3

figures are shown in Table 5   In upper abdominal operations there are more than twice as many pulmonary complications under ether as under spinal anesthesia, while in lower abdominal operations the variation between the two anesthetics is not enough to be significant

These figures are at direct variance with those of McKittrick It seems probable, therefore that in his case there was, as suggested earlier some special condition present which influenced the result   This factor may well have been the close attention and care with which his cases of spinal anesthesia were followed up after operation as compared with the ordinary routine on the other service   It is highly probable that on any large hospital service a careful follow up of patients after operation will

disclose many mild pulmonary complications which in the ordinary course of events will escape attention, or at least not be recorded

Conclusion—Spinal anesthesia is not followed by more pulmonary complication than is ether, but on the contrary is probably followed by less

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DIFFICULTIES IN THE DIFFERENTIATION OF POST OPERATIVE PULMONARY COMPLICATIONS

Richard H. Overholt and J. Ross Veal

Evidences of a pulmonary disturbance sufficient in magnitude to cause great concern present themselves quite frequently in patients after abdominal operations. The difficulty of determining the seriousness of such disturbances comes in those patients who have a marked degree of hypoventilation of both lower lobes. These patients often have difficulty in breathing employ the accessory muscles of respiration and have abnormal physical signs. There may be an elevation in the temperature pulse and respiratory rate. Should a bedside roentgenogram be made an intensification or mottling in the lung field and a clouding of the bases will often be shown.

If these signs of a pulmonary complication result from faulty aeration of the lower lobe they disappear in direct proportion to the reestablishment of pulmonary ventilation. Many of these patients actually appear to have a bilateral complete or partial atelectasis of the lower lobes. Should there be a superimposed infection in the lungs the clinical course depending on the extent of the infection will be altered. Obviously once an infectious process has been established an actual pneumonia then exists. This may vary from a small area of pneumonitis to an extensive bronchial or lobular pneumonia.

This transition from a pulmonary disturbance due primarily to a mechanical failure of proper aeration to one which is dependent upon infection makes the differentiation of pulmonary complications difficult.

There is less trouble in recognizing or in evaluating certain other postoperative pulmonary complications. Unilateral mas

sive atelectasis with the shifting of surrounding structures to compensate for the diminished lobe volume is easily recognized Pulmonary infarction as well may present such symptoms and signs to enable one to separate it quite easily from the others Bronchitis, per se, should be easily detected Pleurisy, lung abscess or pulmonary edema should also be considered in the group of pulmonary complications However, these are often associated with other conditions and confusion in the differential diagnosis is less apt to occur

We are summarizing certain case reports which may illustrate some of the problems in the differential diagnosis of post operative pulmonary complications

Case 1—Miss M J C age fifty two years The patient was admitted on December 3 1931 to the New England Baptist Hospital She presented a history typical of chronic gall bladder disease There were no other significant points in the history and subsequent examination failed to reveal any abnormality other than that referable to the gallbladder The chest was entirely negative Dr H M Clute on December 7th removed the gallbladder and did a choledochostomy under spinal anesthesia On the following day examination of the chest showed good expansion of the upper anterior thorax diminished excursions of the lower thorax and a bilateral elevation of the diaphragm which by percussion was on a level with the sixth or seventh rib posteriorly Percussion anteriorly gave a hyper resonant note and the superficial area of cardiac dulness was definitely diminished in size The breath sounds were exaggerated anteriorly and diminished posteriorly On the second day the physical sounds in the chest were the same Three days after operation there was still a definite diminution in the excursion of the lower chest There was a dull percussion note over the right lower lobe Tubular breathing was heard over the same area A bedside roentgenogram showed a high position of the diaphragm and a haziness in the lung above with clear apices (Fig 20b a) A lateral exposure showed obscuration of the costophrenic sinus posteriorly Areas over which tubular

breathing could be heard persisted for forty eight hours, and then crackling rales appeared The chest was entirely clear of abnormal physical signs on the sixth postoperative day A slight nonproductive cough was the only respiratory symptom There was no unusual elevation in the temperature, pulse or respiratory rate (Fig 206) A bedside roentgenogram of this patient taken six weeks after operation showed a normal chest with the diaphragm in its usual position (Fig 205, b)

a   b

Fig 205—Case I a Bedside roentgenogram three days after gallbladder operation Note size of chest position of diaphragm and haziness in the lung fields The ease with which this picture can be confused with pneumonia is well evident b Same case six weeks later Position for exposure similar Note normal diaphragm contour and position expanded lower lobes and clear lung fields

Comment—This patient did not have a pneumonia although she showed signs which might have been due to a consolidation at the right base i e tubular breathing dullness on percussion, and a hazy roentgenogram These signs resulted from hypoventilation of the lower lobe They did not appear at first *because of the presence of residual air in the alveoli* As absorption and apneumatosis took place the signs of apparent

sive atelectasis with the shifting of surrounding structures to compensate for the diminished lobe volume is easily recognized Pulmonary infarction as well may present such symptoms and signs to enable one to separate it quite easily from the others Bronchitis per se should be easily detected Pleurisy lung abscess or pulmonary edema should also be considered in the group of pulmonary complications However, these are often associated with other conditions and confusion in the differential diagnosis is less apt to occur

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Case II—Mr J S J age thirty seven years He was ad mitted to the New England Deaconess Hospital on September 20 1931 He gave the typical story and physical findings of acute appendicitis His chest examination at this time was entirely negative He was operated upon by Dr R H Overholt under spinal anesthesia on the same date and an acute inflammatory appendix was removed No drainage was employed
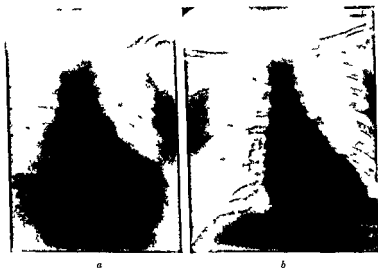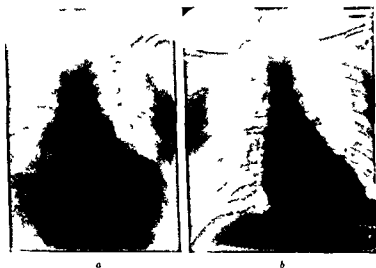

Fig 207—Case II *a* Beds of roentgenogram made twenty four hours after appendectomy Note thoracic size diaphragmatic position and cloud ing of lung fields especially on the right Note absence of cardiac displace ment or difference in intercostal spaces on the two sides *b* Same case four months later Exposure and position the same Note size of normal chest aeration at the bases and compare with postoperative film

The patient had a severe temperature reaction reaching 105 F within twenty four hours The pulse was 100 and the respiratory rate 30 at this time A white blood count was 10,500 The patient had dyspnea and the accessory muscles of respiration were brought into play There was a sense of constriction about the chest The face was flushed and he perspired freely There were no other symptoms such as chest pain cyanosis or cough

consolidation were elicited When expansion was reestablished they disappeared The absence of an increase in temperature and the transient nature of the physical signs also indicate that these findings were a result of a mechanical interference with lung expansion and not to infection The comparison of the roentgenograms taken immediately after operation and six weeks
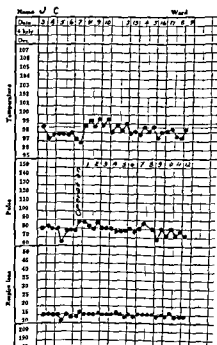
F g 206 —Hospital cl n cal record of Case I Note absence of an ele at on of the temperature pulse or resp ratory rate

later demonstrates very well the reduction in lung volume that follows abdominal operations This has been previously pointed out by one of us [1] The alteration of the appearance of the roent genograms is due to the elevated position of the diaphragm and to the restricted lower thoracic and abdominal respiratory excursions

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Examination of the chest showed diminished expansion of the lower thorax dulness over the right base posteriorly and there was tubular breathing over the same area   There was increased resonance over the chest anteriorly   Dr Menard of the medical department was of the opinion that the complication was either a definite hypoventilation with atelectasis or pneumonia   A
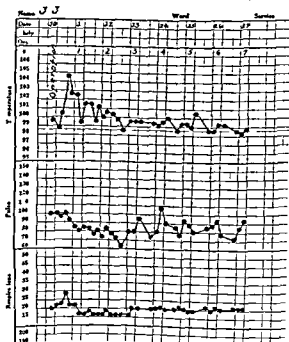

F g 308 — Case II   Hospital clinical record showing marked temperature reaction early in the convalescence   Note ts rapid return to normal Also note slight change in the respiratory rate

bedside roentgenogram was made twenty four hours after operation and the report by Dr L B Morrison was   The domes of the diaphragm are smooth rounded and in position The inter-spaces on the right are slightly narrow   The right chest shows decreased dulness from the diaphragm up to the level of the seventh rib posteriorly   This suggests the possibility of an

actual pneumonia (Fig 207 a) The next day the pulmonary symptoms had disappeared and the temperature made a rapid decline (Fig 208) The tubular breathing at the right base was gone and a few crackling râles were heard with diminished breath sounds After the third day abnormal physical signs in the chest could not be elicited The patient left the hospital in schedule time and was symptom free The patient returned to the clinic for follow up examination four months after opera tion There were no residual lung findings and a bedside roent genogram taken in exactly the same way as the postoperative examination was made to determine the normal thoracic contour for this patient (Fig 207 b)

Comment—During the first twenty four hours of the con valescence there were all of the signs of consolidation of the lower right lobe From the lack of cardiac displacement and with the presence of tubular breath sounds over the involved area one would favor a diagnosis of pneumonia rather than collapse The rapid subsidence of symptoms and physical signs coincidental with increased pulmonary ventilation however forces us to conclude that the principal cause for this patient s pulmonary trouble was failure of aeration rather than infection Certainly such a rapid recovery could not take place if an actual pneumonic process was the cause of the elevated temperature and lower lobe findings This case illustrates very well how a mottling on the x ray may be very confusing The roentgeno gram taken four months later for comparison with the one made after operation shows a marked difference in the position of the diaphragm For this reason much of the change in the lung field could be explained on the basis of a markedly diminished lung volume immediately after operation (Fig 207, b)

Case III Mrs I G M age thirty seven years She was admitted to the New England Deaconess Hospital on July 25 1931 There were symptoms referable to a retrodisplacement of the uterus and the physical examination including the chest showed nothing else On August 1 1931 Dr R B Cattell suspended the uterus and removed the appendix under spinal

Examination of the chest showed diminished expansion of the lower thorax, dulness over the right base posteriorly and there was tubular breathing over the same area There was increased resonance over the chest anteriorly Dr Menard of the medical department was of the opinion that the complication was either a definite hypoventilation with atelectasis or pneumonia A

actual pneumonia (Fig 207 a) The next day the pulmonary symptoms had disappeared and the temperature made a rapid decline (Fig 208) The tubular breathing at the right base was gone and a few crackling râles were heard with diminished breath sounds After the third day abnormal physical signs in the chest could not be elicited The patient left the hospital in schedule time and was symptom free The patient returned to the clinic for follow up examination four months after opera tion There were no residual lung findings and a bedside roent genogram taken in exactly the same way as the postoperative examination was made to determine the normal thoracic contour for this patient (Fig 207 b)

Comment —During the first twenty four hours of the con valescence there were all of the signs of consolidation of the lower right lobe From the lack of cardiac displacement and with the presence of tubular breath sounds over the involved area one would favor a diagnosis of pneumonia rather than collapse The rapid subsidence of symptoms and physical signs coincidental with increased pulmonary ventilation however, forces us to conclude that the principal cause for this patient s pulmonary trouble was failure of aeration rather than infection Certainly such a rapid recovery could not take place if an actual pneumonic process was the cause of the elevated temperature and lower lobe findings This case illustrates very well how a mottling in the x ray may be very confusing The roentgeno gram taken four months later for comparison with the one made after operation shows a marked difference in the position of the diaphragm For this reason much of the change in the lung field could be explained on the basis of a markedly diminished lung volume immediately after operation (Fig 207, b)

Case III —Mrs E G M age thirty seven years She was admitted to the New England Deaconess Hospital on July 25 1931 There were symptoms referable to a retrodisplacement of the uterus and the physical examination including the chest showed nothing else On August 1, 1931 Dr R B Cattell suspended the uterus and removed the appendix under spinal

anesthesia For the first two days after operation the typical
alteration in physical signs due to diminished ventilation were
found, including tubular breathing at the right base At this
time there was a moderate temperature elevation (Fig 209)
There was a distressing cough, little expectoration and no
hemoptysis or chest pain On the third day the temperature

Fig 209—Case III Clinical record showing changes in T P R result
ing from a pulmonary infection engrafted upon a poorly ventilated lung
Compare this record with those of the first 2 cases

went up and the chest signs persisted The right base was dull
to percussion and the tubular breathing was still present At
the height of the temperature reaction the white blood count was
16,400 A bedside roentgenogram made eleven days after opera-
tion demonstrated a mottling of the right lower lobe which con-
cealed the diaphragm and extended up as far as the seventh

interspace posteriorly The heart was displaced slightly to the
right and there was some narrowing of the intercostal spaces
(Fig 210) The fever continued for a week after operation and
there was a gradual clearing of the signs although when the
patient was discharged on the twenty first day there were still
a few rales audible at the right base

Comment—Here is an example of an engrafted infection in
atelectatic lung areas The roentgenogram on the eleventh
postoperative day (see Fig 204) still showed some evidences
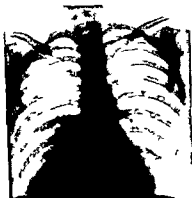
Fig 210 Case III Bedside roentgenogram made eleven days after
pelvic operation Note cloudiness at right base representing residual pul
monary infection Also note that the diaphragm is in about its normal po
sition more of the lung field can be visualized and hence there is less confus on
about the diagnosis

that there was diminished lung volume which means atelectasis
as the intercostal spaces on the affected side were slightly nar
rowed and there was some displacement of the heart to that side
It was impossible to predict the course of events during the
first forty eight hours Symptoms and signs closely resembled
those in cases I and II Here however there was a failure to
maintain adequate pulmonary function which is so necessary if
an infectious process is to be prevented The absence of a sudden
onset of chest pain and hemoptysis together with the distribu
tion of the lesion in the right lung base as demonstrated in the

roentgenogram are sufficient to rule out the possibility of an infarction Spinal anesthesia at the time of the operation and the freedom of bronchial symptoms throughout the convalescence make it very improbable that aspiration was responsible for the pulmonary complication

Case IV—Mr D P age fifty nine years This man was admitted to the New England Deaconess Hospital on December 1, 1931 presenting symptoms of chronic gallbladder disease
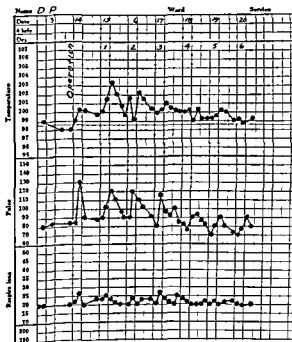
Fig 211—Case IV Clinical chart showing T P R of a patient who had a frank postoperative pneumonia Note the persistence of the elevation and its gradual decline

Physical findings were unimportant except for a slight emphysematous type of chest On December 14 1931 Dr Clute did a cholecystectomy and appendectomy under spinal anesthesia

The common duct was not explored   One cigaret drain was
put in the upper abdomen   Twenty four hours after operation,
there was a temperature elevation as high as 104 F (Fig 211)
Productive cough, hiccough, moderate dyspnea and slight cy
anosis were present   Chest discomfort or pain was not com
plained of   In addition to the usual postoperative diminished
expansion, diaphragmatic elevation and anterior emphysema,
there was dulness at the left base and tubular breathing   After
several forced inhalations the tubular breathing disappeared
and was replaced by râles   A marked fall in temperature took
place that day   On the second postoperative day there was a

Fig 212—Case IV   Fourth postoperative day bedside roentgenogram   The
d agnos s is qu te definite   Note d strt ut on of the mottl ng

return of the tubular breathing with a suppression of breath
sounds and dulness on percussion   There was expectoration of
thick tenacious sputum of prune juice character on the third
postoperative day and râles were heard extensively over the left
chest   The temperature again ascended, and a roentgenogram
taken on the fourth day showed a mottling quite extensive, on
the left side (Fig 212)   A diagnosis of bronchopneumonia was
made   Physical signs could be elicited over the left chest for a
period of ten to twelve days although the temperature returned
gradually to normal within a six-day period

Comment—The routine evaluation of the postoperative pul

monary status of this patient showed at first the effects of faulty aeration The fact that on the first postoperative day deep breathing caused a disappearance of the tubular breath sounds indicated that this sign was elicited over a poorly ventilated lung Proper ventilation could not be maintained and super imposed infection was evident on the third day with an ex tension rather than a clearing of the process The presence of prune juice sputum a slowly subsiding temperature and per sistent rales proved that a true pneumonia existed Therefore this case is classified as a postoperative bronchopneumonia whereas Cases I and II were not

Case V—Mrs M N B age thirty seven years This pa tient was admitted to the New England Deaconess Hospital for a tonsillectomy A preoperative examination of the chest revealed no abnormality On June 21 1929 Dr W B Hoover performed a tonsillectomy under local anesthesia On the fol lowing day her temperature reached 103 F the pulse was 120 and the respiratory rate 22 (Fig 213) She complained of pain in the chest and epigastrum Dr Hurtthal of the medical de partment found dullness and diminished breath sounds over the right lower lobe posteriorly On the second postoperative day there was an area over which tubular breathing was heard A roentgenogram on the third postoperative day revealed an in creased area of density at the right base which was interpreted as representing pneumonia (Fig 214) The temperature sub sided in forty eight hours and the physical signs disappeared almost equally as fast On July 1st six days after the first roentgenogram a second study was made and a perfectly nor mal chest found The patient was discharged entirely well on July 4th thirteen days after operation

Comment—The differential diagnosis here lies between as piration with atelectasis pneumonia and infarction Any pul monary complication after tonsillectomy makes one suspicious of an embolic lesion The pain which this patient complained of shortly after operation might support this diagnosis The absence of hemoptysis and the transitory nature of the physical

Fig 213 —Case V Clinical record showing marked febrile reaction with rapid subsidence following tonsillectomy Correlate this record with the roentgenographical findings

Fig 214 —Case V Bedside roentgenogram made on third day after tonsillectomy Six days later a roentgenogram showed normal lung fields.

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aeration The fact that on the first postoperative day deep
breathing caused a disappearance of the tubular breath sounds
indicated that this sign was elicited over a poorly ventilated
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of shortly after operation might support this diagnosis The
absence of hemoptysis and the transitory nature of the physical

present date two and a half weeks after the onset of the symptoms of the pulmonary complication

Comment—There can be little doubt that this complication is one due to an embolic process The freedom of pulmonary symptoms throughout the early part of the convalescence, the
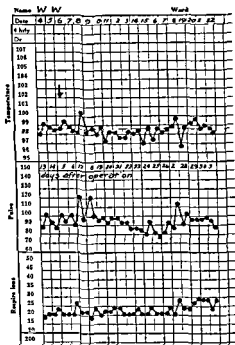

Fig 215—Case VI Clinical record of a patient who had a suprapubic cystostomy performed Arrow indicates time when pulmonary symptoms developed on the fifteenth postoperative day Note small rise in temperature on the seventeenth day The change in the pulse rate was more indicative of a disturbance than the temperature or respiratory rate

sudden appearance of pain in the chest hemoptysis and cough with later a friction rub rales and tubular breathing are all indicative of pulmonary infarction Roentgenographical examination verified this diagnosis The shadow in the lung was small and its location and appearance entirely different than that seen in the other cases The fact that the signs in the chest

signs together with the fact that the x ray shadow completely disappeared in a short time would definitely indicate that an embolic process was not present Certainly, an occlusion of a pulmonary vessel large enough to produce such roentgeno graphical findings at one time would cause destruction of pul monary tissue with subsequent scarring This complication was most likely caused by aspiration at the time of operation bronchial occlusion and a resulting area of atelectasis

Case VI—Mr W W age fifty eight years This patient was admitted to the New England Baptist Hospital because of prostatic hypertrophy Physical examination revealed no other pathology except some arteriosclerosis and a blood pressure of 180/120 Examination of the lungs showed them to be normal A suprapubic cystostomy and bilateral vasectomy was performed by Dr J B Hicks on December 22 1931 under sacral and regional anesthesia His convalescence was uninterrupted in all respects for a period of fifteen days During this time he had regained enough strength to be out of bed On January 7th he complained of a sudden pain in the right chest There was a temperature elevation on this day with an immediate return to normal (Fig 215) On physical examination there was dimin ished expansion at the right base a slight diminution in per cussion especially in the lower lateral aspect of the chest and extending slightly anteriorly and the breath sounds were dis tant with occasional crackling râles Two days later the patient's cough became productive of bright red sputum A bedside roentgenogram was made three days after the onset of his chest pain and a small area of density was seen near the hilum of the right lower lobe (Fig 216) Four days after the onset of this complication Dr O J Menard found that the area of dulness had slightly increased in size there was possibly some shift of the heart to the right the breath sounds were diminished at the extreme base and just above this point tubular breathing could be heard A diagnosis of either infarct or collapse was made A friction rub was heard from time to time The diminished dulness and râles have persisted to the
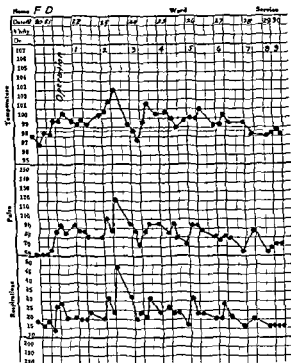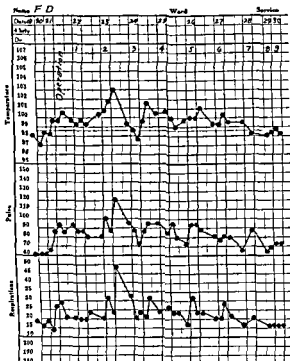
Fig 217.—Clinical chart showing reaction in the case of massive atelectasis Note sharp onset and the slow return to normal Compare this with Figs 206 and 208

Fig 218.—Bedside roentgenogram forty eight hours after operation showing classical picture of massive atelectasis Notice homogeneous density, cardiac displacement, and narrowed intercostal spaces on the left

have persisted so long demonstrates that actual injury to pulmonary tissue has resulted   It is interesting to compare the roentgenogram in this type of pulmonary complication with the film of a patient with hypoventilation that comes immediately after abdominal procedures, or with the film of a patient having actual pneumonia   In the first cases reported in this group the physical signs and roentgenographical appearances were very much out of proportion to the seriousness of the lesion and the mildness of the symptoms   In this case of infarction, however, the symptoms physical signs and gravity of the complica

Fig 216—Case VI   Bedside roentgenogram taken four days after pulmonary infarct   Note well defined area in right lower lobe and clearness of bases

tion were out of proportion to the changes in the chest as shown by the roentgenogram

In Figs 217 and 218 there are shown the roentgenogram and temperature chart of a patient at the time of a typical massive atelectasis of the entire left lung   This patient a man aged eighteen years was operated upon by Dr Lahey in November, 1925   The case has been reported in detail by Dr Mason   Two and a half days after operation pulmonary symptoms developed and the patient showed by x ray an increased density of the entire left chest cardiac displacement elevation of the diaphragm and narrowed intercostal spaces on that side   This

Fig 217—Clinical chart showing reaction in the case of massive atelectasis Note sharp onset and the slow return to normal Compare this with Figs 206 and 208

Fig 218—Bedside roentgenogram forty eight hours after operation showing classical picture of massive atelectasis Notice homogeneous density, cardiac displacement, and narrowed intercostal spaces on the left

x ray is shown in order to contrast the appearance with that seen in other types of pulmonary complications It shows the typical cardiac displacement and the adjustment of the ribs and diaphragm to the decreased size of the lung on one side It is possible, however, to have a bilateral basal collapse or even a unilateral basal collapse without cardiac shift Compensatory emphysema of the upper lobes and elevation of the diaphragm accommodate for the decreased lung volume without cardiac displacement This is demonstrated in the first 2 cases of this series

The diagnosis of postoperative pulmonary complications is dependent upon the evaluation of the symptoms, physical findings and the roentgenographical changes in relation to their time of onset and their duration An effort should be made to distinguish between the effects of postoperative hypoventilation and those due to infection

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THE CARBON DIOXIDE ABSORPTION METHOD OF GAS ANESTHESIA

Philip D. Woodbridge

After using the carbon dioxide absorption technic for gas anesthesia for over a year at the Lahey Clinic, we are convinced that it is a decided improvement over the usual method of administration. In brief it consists of the chemical removal of carbon dioxide from the exhaled gases and the continuous addition thereto of oxygen at the rate at which it is consumed by the body. The principles involved were used by Jackson in 1916 and several years later were adapted to clinical use by Waters. It is he who is responsible for the increasing interest in this method among anesthetists in recent years.

In the usual method of producing anesthesia with gas (either ethylene or nitrous oxide with or without ether) an effort is made to determine the proportion in which the gas should be mixed with oxygen to maintain the desired depth of anesthesia. This mixture is then fed continuously throughout the course of anesthesia into a reservoir which consists of the breathing bag and face mask.* A valve in the mask allows excess gas to escape and the patient breathes out of and into this reservoir. Part of each exhalation passes out through the escape valve, and the rest returns to the reservoir. Of the mixture of fresh gases that is constantly supplied to the reservoir after anesthesia has been induced, part of the oxygen is needed by the body for its oxidative processes *but the sole function of the constant flow of anesthetic gas (ethylene or nitrous oxide) is to wash out the accumulating carbon dioxide from the reservoir.* Once the patient has reached a

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* In the McKesson machine the fresh gases flow intermittently with each respiration but the same principles hold with this type as with the continuous flow type.

satisfactory plane of surgical anesthesia his body needs no additional anesthetic gas to maintain that level. All that is required is that the pressure of anesthetic gas in the blood stream be kept constant.

The cost of gas for anesthesia is variously estimated to be from $2 to $5 per hour, depending on how high a concentration of accumulating carbon dioxide the anesthetist wishes the patient to inhale. The gas used in the first five or ten minutes is necessary to induce anesthesia. Thereafter a very slow flow of oxygen is required for the body's metabolism. But by far the greater portion of these expensive agents is used merely to rinse carbon dioxide out of the reservoir.

CHEMICAL REMOVAL OF CARBON DIOXIDE

The carbon dioxide may, of course, be much more cheaply removed chemically. Less than a dollar's worth of soda lime granules (sodium and calcium hydrate) introduced into the reservoir system will remove the carbon dioxide exhaled during six to twelve hours of anesthesia and will thereby greatly improve anesthesia in several respects that will be noted later. This method of gas administration is referred to as the carbon dioxide absorption technic.

APPARATUS

A canister containing 500 Gm. or more of soda lime is introduced into the reservoir system between the breathing bag and the mask. (Fig. 219) It is attached to the gas machine and the bag is connected to its lower end. Two large flexible breathing tubes connect its upper end with the mask. Between each of these tubes and the canister is a sensitive flutter valve permitting gas to flow in but one direction in each tube. These are so arranged that the patient inhales through one tube and through the other he exhales into the soda lime. Beyond the soda lime the exhaled gases pass into the breathing bag. Thence during inhalation they are carried past (not through) the soda lime and to the patient by way of the inhaling tube. In dis-

tinction to a method to be described later this may be called
the circuit, or closed circle, method   Fresh gases supplied from
the machine are piped into the inhaling tube   A sliding valve on
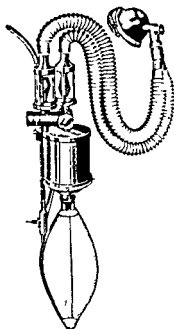the canister allows the anesthetist to shunt all or any portion

Fig 219 — Carbon dioxide absorber circuit breathing   The one way
rubber flutter valves are seen in the glass cages above the soda lime canister
Fresh gases enter above the inhaling valve through the small tube at the left
Below these is a valve for directing exhalations either through or around the
soda lime   The bracket is of adjustable height   (Photo from The Foregger
Co)

of the exhaled gases around the soda lime, when it is desired to
stimulate respiration by letting carbon dioxide accumulate in
the reservoir

The apparatus may be used on any gas machine that is
capable of delivering under sensitive control, a slow flow of

satisfactory plane of surgical anesthesia his body needs no additional anesthetic gas to maintain that level All that is required is that the pressure of anesthetic gas in the blood stream be kept constant

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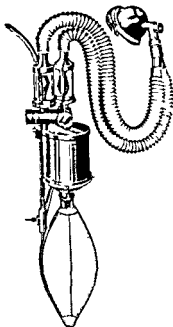

Fig 219—Carbon dioxide absorber circut breathing The one way rubber flutter valves are seen in the glass cages above the soda lime canister Fresh gases enter above the inhaling valve through the small tube at the left Below these is a valve for directing exhalations either through or around the soda lime The bracket is of adjustable height (Photo from The Foregger Co)

of the exhaled gases around the soda lime when it is desired to stimulate respiration by letting carbon dioxide accumulate in the reservoir

The apparatus may be used on any gas machine that is capable of delivering under sensitive control, a slow flow of

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patient usually between 200 and 300 cc per minute If the
oxygen is flowing at the correct rate and if there is no leak no
further adjustment will be necessary throughout the remainder
of the operation The anesthetic gas in the reservoir and lungs
will stay in equilibrium with that in the blood the exhaled
carbon dioxide will be removed by the soda lime and the
oxygen consumed will be replaced by the slow flow from the
machine

Usually however some further adjustment will be needed
from time to time If the flow of oxygen is less than the patient
needs the bag will slowly deflate and anesthesia will deepen
The flow of oxygen should then be increased On the other hand
if the supply of oxygen is greater than needed the bag will
become distended and anesthesia will lighten The flow of
oxygen should then be diminished If there is a leak in the reser
voir system as indicated by progressive deflation of the bag with
out change in depth of anesthesia the leak should be stopped
if possible or if this cannot be done a sufficient flow of the
gases should be added to compensate for the leak usually less
than 1 liter of anesthetic gas per minute with an additional 100
cc or so of oxygen will suffice to do this

If at any time it is desired to deepen anesthesia quickly a
rapid flow of the anesthetic gas will fill the inhaling tube so that
the next breath or two or more if desired will consist of the
anesthetic gas only slightly diluted with oxygen This will
quickly deepen anesthesia without overcorrecting the entire
body of gas in the reservoir In the same way oxygen may be
added rapidly to lighten anesthesia quickly If at any time it is
desired to increase the depth of respiration the exhaled gas may
be partly or wholly shunted around the soda lime by adjusting
the valve on the canister and if additional carbon dioxide is
needed it may be added from the tank on the machine If ether
is used to supplement the gas it may be necessary to continue
to carry it in in very small amounts with the oxygen during
the first half hour of anesthesia because of its disappearance
from the blood stream into the fat of the body

oxygen, that is, from 200 to 400 cc per minute (about 3 to 6 gallons per hour) * It is necessary to have all connections gas tight for leaks that would be insignificant with the constant flow of gas used in the ordinary method become intolerable when reliance is placed on one filling of gas to last throughout an operation This is particularly true in the fitting of the mask to the face Even for many who are accustomed to using gas in the ordinary way, considerable practice is required to eliminate slight leaks under the mask

METHOD OF USE

For induction the anesthetist sets the valve on the canister so as to cut out the soda lime from the circuit starts the gases flowing in the proportion and at the rate which he is accustomed to use and applies the mask to the patient s face taking great care to see that it fits snugly It should be fastened in place by a retaining strap which passes behind the patient s head or neck When the bag is full the escape valve on the mask is opened slightly This will allow surplus amounts of the gas now diluted with nitrogen from the patient s lungs to escape Ether if desired may be added in the usual way If any degree of respiratory obstruction develops a pharyngeal airway so-called should be inserted The prevention of respiratory obstruction appears to be of even greater importance in this form of anesthesia than in others Thus far the procedure differs in no respect from the usual method of administering gas

When anesthesia has become stabilized at a suitable depth (usually in from three to ten minutes) the switch to carbon dioxide absorption technic is made in the following way The escape

01 00 y6

* If the machine can deliver this amount but its gauges are not sufficiently sensitive to measure it an inexpensive flow meter with shunt valve may be attached to the outlet of the machine

patient usually between 200 and 350 cc per minute If the oxygen is flowing at the correct rate and if there is no leak no further adjustment will be necessary throughout the remainder of the operation The anesthetic gas in the reservoir and lungs will stay in equilibrium with that in the blood the exhaled carbon dioxide will be removed by the soda lime and the oxygen consumed will be replaced by the slow flow from the machine

Usually however some further adjustment will be needed from time to time If the flow of oxygen is less than the patient needs the bag will slowly deflate and anesthesia will deepen The flow of oxygen should then be increased On the other hand if the supply of oxygen is greater than needed the bag will become distended and anesthesia will lighten The flow of oxygen should then be diminished If there is a leak in the reservoir system as indicated by progressive deflation of the bag without change in depth of anesthesia the leak should be stopped if possible or if this cannot be done a sufficient flow of the gases should be added to compensate for the leak usually less than 1 liter of anesthetic gas per minute with an additional 100 cc or so of oxygen will suffice to do this

If at any time it is desired to deepen anesthesia quickly a rapid flow of the anesthetic gas will fill the inhaling tube so that the next breath or two or more if desired will consist of the anesthetic gas only slightly diluted with oxygen This will quickly deepen anesthesia without overcorrecting the entire body of gas in the reservoir In the same way oxygen may be added rapidly to lighten anesthesia quickly If at any time it is desired to increase the depth of respiration the exhaled gas may be partly or wholly shunted around the soda lime by adjusting the valve on the canister and if additional carbon dioxide is needed it may be added from the tank on the machine If ether is used to supplement the gas it may be necessary to continue to carry it in in very small amounts with the oxygen during the first half hour of anesthesia because of its disappearance from the blood stream into the fat of the body

TO AND FRO METHOD

A simpler form of apparatus is preferred by Waters Guedel and others The soda lime canister is connected directly to the chimney of the mask, and to the other end of the canister is attached the breathing bag (Fig 220) Fresh gas from the machine is piped into the connection between the mask and the canister When it is desired to accumulate carbon dioxide slip joints at both ends of the canister permit it to be removed from the reservoir system and the bag to be attached directly to the chimney The principles of its use are similar to those of the
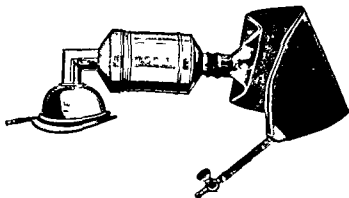
Fig 220—Carbon dioxide absorber to and fro breathing Fresh gases enter at the nipple above the mask Slip joints at each end of the canister permit it to be removed when desired and the bag to be attached directly to the chimney of the mask (Photo from The Foregger Co)

circuit method Its advantages are that it is less expensive and bulky, it is easily portable there are fewer joints to leak there is less resistance to the ebb and flow of exhaled gases and during an operation the canister may be replaced by another if the soda lime becomes exhausted Its disadvantages are that the man euver required to remove the soda lime from the system is awkward and may permit dilution of the gases with air the gas cannot be partly shunted around the soda lime—when the can ister is in place all gas must pass through it and in certain
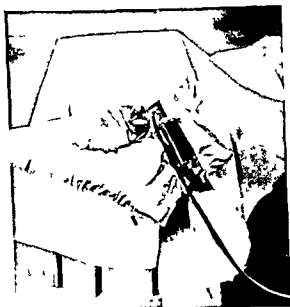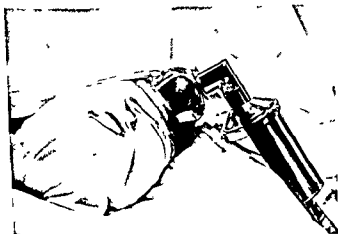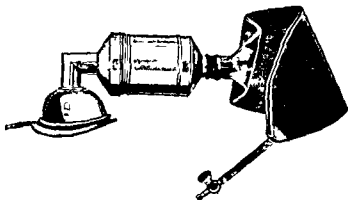
Fig 221

Fig 222

Figs 221 222 —Carbon dioxide absorber to and fro breathing   A full
sized bed pillow is used and patient s head turned to one side   The weight
of the soda lime and mask and the retaining strap around the head hold the
mask securely in place   (Photos from Dr Ralph M Waters)

TO-AND-FRO METHOD

A simpler form of apparatus is preferred by Waters Guedel and others The soda lime canister is connected directly to the chimney of the mask and to the other end of the canister is attached the breathing bag (Fig 220) Fresh gas from the machine is piped into the connection between the mask and the canister When it is desired to accumulate carbon dioxide slip-joints at both ends of the canister permit it to be removed from the reservoir system and the bag to be attached directly to the chimney The principles of its use are similar to those of the

F g 220—Carbon d ox de absorber to and fro breathing Fresh gases enter at the n pple above the mask Sl p-jo nts at each end of the can e permt it to be remo ed when des ed and the bag to be attached d rectly to the ch mney of the mask (Photo from The Fro egger Co)

circuit method Its advantages are that it is less expensive and

lime becomes exhaust o s d sadvantages are that the man euver required to remove the soda lime from the system is awkward and may permit dilution of the gases with air the gas cannot be partly shunted around the soda lime when the canister is in place all gas must pass through it and in certain

bon dioxide has been removed from the inhaled gases respira
tion is quiet with this form of anesthesia resembling that
of normal sleep This appears to be the greatest advantage of
this method Aside from the general pleasing appearance of
quiet breathing there are two very important benefits derived
First the patient s energy is very greatly conserved To sub
ject an extremely toxic thyroid patient or a dangerously septic
patient to a procedure that makes him pant as he would if he
had run up a flight of stairs (as administration of gas occa
sionally does) and to continue this for from twenty minutes to
an hour or more must draw considerably on his depleted reserve
of strength The removal of carbon dioxide saves much of this
apparently wasted energy—frequently breathing is delightfully
quiet The second important benefit is that the lessening of
respiratory movements makes the task of the surgeon easier
when working in the abdomen Rhythmic movements of the
abdominal wall and of the viscera are diminished in the same
degree that breathing is quieted

Postoperative Vomiting—Persistent vomiting after thyroid
ectomy formerly very prevalent in our experience has become
decidedly infrequent since the adoption of this technic There
have been no changes in preoperative or postoperative care or
in operative technic that would account for this change Al
though preliminary narcotics have been changed slightly yet
there have been such variations in these changes and even in the
assortment and amounts of drugs that individual patients have
received that we must look to the adoption of this method of
gas anesthesia as the probable cause of the marked lessening in
vomiting

CONCLUSION

Because the carbon dioxide absorption method of adminis
tering gases brings quiet effortless breathing conserves the
patient s fluids reduces the cost of gas to the point where it
need scarcely be denied to anyone and appears to lessen vomit
ing markedly after certain operations we feel that it offers a
distinct advance in gas anesthesia and should be widely adopted

operations about the head and neck it may be difficult to place the canister so as to make the mask fit tightly   Although it would appear to those who have not used this method that the canister and mask would be awkward to manage in the ordinary surgical case, yet the experience of the author and of those who have used it more extensively is quite to the contrary   If a full sized bed pillow is used and the patient's head turned slightly to one side (Figs 221, 222), the farther end of the canister will rest in the pillow and the weight of the soda lime will help to hold the mask against the face

ADVANTAGES OF CARBON DIOXIDE ABSORPTION

Amount of Gas Used —The great saving in the cost of gas anesthesia by the use of this technic has already been referred to   The amount of gas used in the first five or ten minutes of each operation will remain as before   Thereafter the oxygen flow will be reduced to 200 to 500 cc per minute (approximately 3 to 8 gallons per hour) and the flow of anesthetic gas will either be stopped entirely or will be merely sufficient to compensate for any leaks in the apparatus—usually this will not exceed 1 liter per minute or about 16 gallons per hour   The cost of the soda lime is less than 15 cents an hour   The method thus removes one of the serious drawbacks of gas administration and makes this least toxic form of general anesthesia more widely available for patients of limited means

Odor —Ethylene or ether may be used without objectionable contamination of the air of the operation room since little or none escapes from the apparatus after the first few minutes of anesthesia

Body Heat and Moisture   With total rebreathing the patient inhales warm moist gas—the same gas and moisture that he exhaled   Thus with each breath he is saved the burden of warming and saturating with moisture a new tidal volume of gas   In prolonged anesthesia the resulting conservation of body fluids is considerable   It seems reasonable to assume that this tends to reduce postanesthetic shock

Depth of Respiration —Because the greater part of the car

bon dioxide has been removed from the inhaled gases respiration is quiet with this form of anesthesia resembling that of normal sleep This appears to be the greatest advantage of this method Aside from the general pleasing appearance of quiet breathing there are two very important benefits derived First the patient's energy is very greatly conserved To subject an extremely toxic thyroid patient or a dangerously septic patient to a procedure that makes him pant as he would if he had run up a flight of stairs (as administration of gas occasionally does) and to continue this for from twenty minutes to an hour or more must draw considerably on his depleted reserve of strength The removal of carbon dioxide saves much of this apparently wasted energy—frequently breathing is delightfully quiet The second important benefit is that the lessening of respiratory movements makes the task of the surgeon easier when working in the abdomen Rhythmic movements of the abdominal wall and of the viscera are diminished in the same degree that breathing is quieted

Postoperative Vomiting—Persistent vomiting after thyroidectomy, formerly very prevalent in our experience, has become decidedly infrequent since the adoption of this technic There have been no changes in preoperative or postoperative care or in operative technic that would account for this change Although preliminary narcotics have been changed slightly, yet there have been such variations in these changes and even in the assortment and amounts of drugs that individual patients have received that we must look to the adoption of this method of gas anesthesia as the probable cause of the marked lessening in vomiting

CONCLUSION

Because the carbon dioxide absorption method of administering gases brings quiet effortless breathing conserves the patient's fluids reduces the cost of gas to the point where it need scarcely be denied to anyone and appears to lessen vomiting markedly after certain operations we feel that it offers a distinct advance in gas anesthesia and should be widely adopted

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RESECTION OF STOMACH FOR CANCER IN TWO STAGES
A CASE REPORT

HOWARD M. CLUTE

PARTIAL gastrectomy or subtotal gastrectomy for cancer of the stomach is a dangerous procedure and in our experience it is accompanied by a high mortality rate   The fact that the mortality of these resections is higher than in similar operations for peptic ulcer of the stomach is due we believe to the frequent necessity of more radical removal of stomach tissue to the poorer healing of the suture lines to the poor general condition of the patients and to their more advanced years

As one reviews and analyzes the operative mortality after resection of the stomach for cancer the duration of life following successful resection and the degree of improvement appearing in those patients who survive the operation for a relatively short time one is forced to a serious consideration of the indications and the value of this procedure   Certainly we are convinced that total resection of the stomach should rarely be attempted with the technical methods at present available   This procedure has been undertaken four times in the clinic with one patient surviving operation and with a good result   Because of the high mortality in subtotal resection of the stomach for cancer in our experience it would seem that the indications for resection in cancer of the stomach should be thoroughly and carefully reviewed and that possibly fewer attempts should be made to eradicate hopeless lesions which at the time of operation are found to be advanced beyond the stage of easy removal

It has always been difficult to refuse to try to remove gastric cancer and increasing experience in gastric surgery tends to make the surgeon increasingly radical in his procedures   It is doubtful however if this is at least at present a policy to be

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to wait from two to three weeks at least after the gastro
enterostomy in order that the suture line between the jejunum
and the stomach may be sufficiently firm to withstand the man
ipulation incident to gastric resection We also like to have the
patient reach a condition in which she can get out of bed after
the gastro enterostomy and be up and about on her feet for a
few days before resection is undertaken This of course may
not always be possible but when it can be done we feel that the
increase in cardiovascular tone thus obtained is highly advan
tageous

The following brief resumé of a recent case is instructive in
relation to the points we have been discussing

Mrs L, age sixty four years came in to the clinic June 19
1931 complaining of indigestion for many years About nine
months before entrance indigestion became more severe and
vomiting occurred The vomiting has become more frequent
and now she vomits every day and is able to keep down scarcely
any food or fluid Her weight has gone down from something
over 100 to 84 pounds on entrance to the clinic In the past
this patient has had pneumonia twice and repeated attacks of
pleurisy Her examination showed her to be an emaciated
cachectic feeble woman Her chest showed definite chronic fibroid
phthisis her abdomen was flat and retracted and a mass the size
of a lemon could be seen and moved about in the region of the
pylorus

Ten days after admission to the clinic after careful prelim
inary preparation with gastric lavage intravenous and sub
pectoral saline and glucose a posterior gastro enterostomy was
performed under regional anesthesia For this a high left rectus
incision was made since we anticipated that a pyloric resection
would be easier at a later date through a midline or right rectus
incision At the time of the gastro enterostomy no extensive
metastases could be felt beyond a few glands near the pyloric
tumor

Recovery from the gastro enterostomy was made without
difficulty, save for some gastric retention immediately post
operatively relieved by an indwelling Levin stomach tube

recommended Of course the pyloric lesions which are sharply localized offer the most hope of successful removal Even in these lesions however, when nodules are present high in the gastrohepatic omentum or in the liver it is doubtful if sub total resection is worth the risk Certainly in high lesions in which portions of the tumor are adherent to the pancreas and numerous glands are present in the gastrocolic or gastrohepatic omentum the high mortality rate should militate against radical operation When obvious extension of the tumor is seen microscopic metastases can be found at autopsy well beyond the area of possible resection This fact coupled with the high operative risk should make us more conservative in our attempts to remove extensive cancer of the stomach

There are certain cases in our experience relatively rare who can be done safely in two operations who would otherwise die if attempted in one procedure These patients have lesions of the pylorus usually relatively early and usually with pyloric obstruction They are patients who are old and feeble because of weight loss and cachexia They are patients who are obviously seriously affected by the lack of food and fluid intake over a period of some time Much more rarely do we see patients with a lesion higher in the stomach wall and well away from the pylorus in whom a two stage resection is possible Gastro enterostomy as a first operation in preparation for later subtotal gastrectomy can occasionally be done in these patients with relative ease and facility They are generally thin and have retracted abdominal walls which are relaxed and permit relatively simple exposure of the stomach Regional or local anesthesia is generally entirely adequate for this procedure and therefore the postoperative shock involved is materially reduced if not entirely absent The improvement following gastro enterostomy done under these conditions is occasionally most remarkable just as it is in patients with pyloric obstruction from simple ulcer The interval which one should wait between the primary gastro-enterostomy and the secondary resection must vary of course, in each patient with the degree of improvement and the amount of strength which the patient regains We would prefer

Operative procedures for bilateral abductor paralysis have in general been quite unsatisfactory We have, however been quite pleased with the procedure described by Dr W B Hoover of this clinic published in the Surgical Clinics of North America, April 1931, in which by means of submucous removal of the cord through a laryngofissure, a good glottic space can be obtained Dr Hoover has successfully employed this operative plan which he has described in 4 cases in which he has been able to remove permanent tracheotomy tubes and the patients have been able to obtain plenty of air through their larynx even on extraordinary exertion

Bilateral abductor paralysis can be a real emergency The glottic space can become so narrow that if the patient is subjected to any extraordinary exertion the diminished amount of air is so insufficient that cyanosis labored respiration and real difficulties arise In such cases it is wise to do an immediate tracheotomy to provide sufficient air to the patient and to later undertake repair of the cords

Conclusions —Experimental evidence indicates that the adductor portion of the recurrent laryngeal nerve has greater resistance to injury than the abductor portion

Bilateral injury to the recurrent laryngeal nerve does not evidence itself by immediate respiratory difficulties but by immediate loss of voice ultimate return of voice and late respiratory difficulties due to fibrosis and contraction of the cords

Accurate hemostasis a dry field and a wide exposure are the best protective measures in the surgery of the thyroid against injury to the recurrent laryngeal nerve

The recurrent laryngeal nerve can be demonstrated anatomically readily at the point where the inferior thyroid artery divides and at the point where the nerve enters the larynx beneath the inferior fibers of the constrictor muscles

Ligation of the inferior thyroid artery of the trunk behind the common carotid artery is a safer measure to control hemorrhage without injury to the recurrent laryngeal nerve than ligation of the terminal trunks through the remnant of the gland when excessive bleeding occurs

Within two weeks the patient was taking fluids and soft solids with but slight difficulty She had occasional regurgitation of food She was now able to get out of bed into a wheel chair and approximately four weeks after the posterior gastro-enterostomy was ready for the second stage of her gastric resection

On July 27 1931 a subtotal gastrectomy was done through a right rectus incision with regional anesthesia and ethylene-oxygen gas The gastro-enterostomy was firmly healed and presented a wide opening It was high on the posterior wall of the stomach which perhaps accounted for some of the gastric retention following its establishment The resection of the stomach was readily performed and was followed at its conclusion by a citrated blood transfusion

Recovery from this second operation was quite satisfactory and was marked by no complications other than a mild infection in the superficial tissues of the wound The patient's weight which had dropped to 68 pounds before the resection gradually increased she soon was able to take food and fluids in increasing amounts and left the hospital about one month after the second procedure

We last saw this patient on January 22 1932 at which time her weight was over 100 pounds she was suffering from no digestive disturbances was doing all her own housework and at that time at least was in excellent condition

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Ligation of the inferior thyroid artery of the trunk behind the common carotid artery is a safer measure to control hemorrhage without injury to the recurrent laryngeal nerve than ligation of the terminal trunks through the remnant of the gland when excessive bleeding occurs

When respiratory difficulties really occur as the result of bilateral abductor paralysis immediate tracheotomy is indicated

Submucous resection of the cord or cords as proposed by Dr W B Hoover in this clinic has proved a useful procedure in old, long standing cases of bilateral abductor paralysis, and permits the removal of the tracheotomy tube and normal breathing through the larynx

THE DIAGNOSIS OF GASTROJEJUNAL ULCER

EVERETT D. KIEFFER

THE accurate preoperative diagnosis of gastrojejunal ulcer offers a distinct challenge to the skill of the clinician roentgenologist and surgeon The tendency of the ulcer to persist without proper treatment the severity of the symptoms and the seriousness of the complications which are apt to develop make the diagnosis all the more important The frequency with which gastrojejunal ulcer follows gastro enterostomy is quoted at widely varying figures but there is no doubt that the incidence is sufficiently high to make it the most important consideration in the differential diagnosis of persisting or recurrent dyspepsias after gastro enterostomy

The history is the most important source of clinical information In practically all cases there is a period after gastro enterostomy varying from a few weeks to several years during which the patient is completely relieved of symptoms Then there is a recurrence of symptoms which the patient is apt to describe as being identical with his original symptoms However as Jordan has pointed out there is necessity for caution in the interpretation of the history given by the ulcer trained patient The patient is so apt to describe the symptoms of disorders of the gallbladder appendix colon and gastro intestinal neurosis in the light of his previous ulcer experience that unless he is closely questioned on each point his volunteered history is apt to be misleading

In general the pain is usually more severe than the original ulcer distress It is located definitely lower than the pain of the original ulcer and is usually more to the left side with a tendency to radiate to the back and lower abdomen In several of our

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cases the back pain and downward radiation has been so marked
that cystoscopical examinations were made to rule out disease of
the urinary tract The ordinary relief measures such as food and
alkalis are not quite as effectual as before although some relief
is obtained in this way

Vomiting is fairly frequent and severe obstructive symptoms
may occur

Hemorrhage both gross and occult is more likely to occur in
gastrojejunal ulcer than in ulcers of the stomach or duodenum
When there has been no history of preoperative bleeding the
occurrence of a hemorrhage has particular significance

The physical examination may be negative but loss of weight
pallor and localized tenderness in the region of the stoma are
frequent findings A palpable mass in the region of the umbilicus
is an important but inconstant finding

The gastric acidity is found in a large percentage of cases to
be higher than would be expected in a stomach with a normally
functioning gastro enterostomy This observation has been
reported by Eusterman[1] and by Jordan

The roentgenologic diagnosis of ulcers at or near the stoma
was developed only a few years ago by Carman[3][4] He pointed
out that the signs of a normal gastro enterostomy are The stomach
is commonly smaller the barium meal passes through the stoma
freely there is no six hour gastric residue the peristalsis is not
overactive the duodenal and jejunal loops are not dilated the
region about the stoma is flexible mobile and not deformed and
the gastric rugae and jejunal markings are maintained He
divided the roentgenologic signs of ulceration into two groups
first the indirect signs or those signs which indicate the pres
ence of pathology and second the direct signs or those signs
which localize the ulceration The indirect signs are Enlarge
ment of the stomach hyperperistalsis gastric spasticity gastric
retention and duodenal dilatation

With these indirect x ray signs combined with a charac
teristic history localized epigastric tenderness hyperacidity and
gastro intestinal bleeding a diagnosis of active peptic ulcer can
be made But the localization of the ulcer whether it be a re

activated or a new ulcer at the stoma cannot be made without the second group of roentgenological signs which are Deformity of the stoma narrowing or irregularity of the jejunum distortion or abolition of the jejunal valvulae conniventes persistent deformity of the stomach closure of the stoma an ulcer niche and a fistula These signs may occur singly or in any combination Only the ulcer niche and the fistula are pathognomonic

In the interpretation of x ray signs one should remember that as in other peptic ulcers the gastrojejunal lesion may be either mucous penetrating or perforating in type

The penetrating type is by far the most common The importance of the ulcer niche in the x ray diagnosis has been emphasized by Strom[5] Moore[6] Scott[7] Camp[8] and Buckstein[9] The best method of examining the stoma is by palpation with only one or two swallows of the barium mixture in the stomach and with the patient in the upright position Scott describes in detail the technic of palpation and the means by which an ulcer niche can be filled with the opaque mixture Serial films frequently show a fleck of barium remaining in the ulcer crater for several hours It is important to distinguish between the normal irregularity about the stoma caused by the longitudinally placed rugae in the stomach and the transverse mucous folds in the jejunum These folds may hold small masses of barium in such a way as to simulate an ulcer niche Signs of inflammation such as distortion of the stomach or jejunum usually surround an ulcer niche In many cases the stoma and contiguous jejunum have a tubular or funnel like appearance caused by the obliteration of the jejunal valvulae conniventes The complete occlusion of a previously functioning stoma is excellent evidence of ulceration at or near this point

Gastrojejunal ulcers may penetrate the mesentery posterior or anterior abdominal wall or into the colon Perforation of the ulcer with abscess formation is common but gastrojejunal colic fistula is the most common complication and when it can be demonstrated by x ray or by colored enema the diagnosis is established Verbrugge[10] reported that in 20 cases of gastro-

cases the back pain and downward radiation has been so marked
that cystoscopical examinations were made to rule out disease of
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Gastric analysis after an Ewald meal 65 cc free HCl 53 total acidity 82 red blood count 4 2 million hemoglobin 70 per cent Tallquist blood Wassermann negative urine normal the stools were free of occult blood

x Ray examinations by means of the barium meal and barium enema showed no obstruction in the gastro intestinal tract The stomach was large and the gastro enterostomy stoma was very irregular and tender Preoperative diagnosis Gastro jejunal ulcer

At operation a markedly indurated ulcer was found situated at the anastomosis and extending into the mesenteric border of the jejunum A lysis of the gastro enterostomy was done Complete recovery followed

The second case falls into the clinical group which may be described as the irregular ulcer or gastric ulcer type in whom the symptoms are more variable and inconstant and occur in more frequent and briefer attacks In our series of 15 cases 5 were so classified

Case II—Mr W H was a white male lawyer aged sixty four years Eighteen years before admission to the clinic he was operated upon for an acute perforation of a duodenal ulcer One and a half years later he had a gastro enterostomy done He was symptom free for one year He then began to have irregular brief attacks of pain localized just left of the umbilicus At first the pain was not severe but it had become increasingly severe so that morphine was necessary for relief He usually vomited with the attacks There was no history of hemorrhage Physical examination showed him to be undernourished The blood pressure was 166 100 No abdominal tenderness or mass

The laboratory findings were Gastric analysis after an Ewald meal 10 cc free HCl 50 total acidity 73 red blood count 4 2 million hemoglobin 60 per cent Tallquist urine negative, blood Wassermann negative the stools were free of occult blood

The x ray examination showed the stomach to be large and hypertonic There was slow passage of barium through the stoma which was irregular There was delay in the duodenal

jejunal colic fistula examined by x ray, the condition was demonstrated in 11 instances.

Fusterman[1] found in a study of 83 cases of proved gastro-jejunal ulcer that they could be classified into four clinical types Although the types are not clear cut and many cases are difficult to fit into any one type, the classification serves to show how protean the manifestations of gastrojejunal ulcer may be

From a series of 15 cases treated at the Lahey Clinic and proved by operation to have a gastrojejunal ulcer, 5 cases are selected and abstracted

The first case falls into the clinical group described by Euster man as the regular ulcer type in whom the symptoms are identical with or similar to those before the gastro enterostomy He reports that 47 per cent of cases fall in this group In our group of 15 cases 4 were so classified

Case I—Number 4670 was a male white electrical worker aged fifty years Nineteen years before admission he had had a gastro-enterostomy done for ulcers of the stomach Previous to the operation he had had recurring attacks of epigastric pain relieved by food There was a history of one gross hemorrhage He was relieved for a period of five years following the operation He then had a return of pain which he stated was identical with the original pain accompanied by vomiting This persisted for several years during which time he had another gross hemorrhage Thirteen months before coming to the clinic he underwent another operation An ulcer of the duodenum was excised but the gastro enterostomy was not disturbed Following this operation he was relieved for three months when the pains returned The pains were severe and cramplike and spread across the lower abdomen lasting all day without much relief from food or soda There was no vomiting He had been told he had intestinal obstruction but his bowels moved normally without laxatives

On physical examination he was underweight The blood pressure was 105 60 The remainder of the physical examination was essentially negative The laboratory findings were

Gastric analysis after an Ewald meal 65 cc free HCl 53 total acidity 82 red blood count 4 2 million hemoglobin 70 per cent Tallquist blood Wassermann negative urine normal the stools were free of occult blood

x Ray examinations by means of the barium meal and barium enema showed no obstruction in the gastro intestinal tract The stomach was large and the gastro enterostomy stoma was very irregular and tender Preoperative diagnosis Gastro jejunal ulcer

At operation a markedly indurated ulcer was found situated at the anastomosis and extending into the mesenteric border of the jejunum A lysis of the gastro enterostomy was done Complete recovery followed

The second case falls into the clinical group which may be described as the irregular ulcer or gastric ulcer type in whom the symptoms are more variable and inconstant and occur in more frequent and briefer attacks In our series of 15 cases 5 were so classified

Case II —Mr W H was a white male lawyer aged sixty four years Eighteen years before admission to the clinic he was operated upon for an acute perforation of a duodenal ulcer One and a half years later he had a gastro enterostomy done He was symptom free for one year He then began to have irregular brief attacks of pain localized just left of the umbilicus At first the pain was not severe but it had become increasingly severe so that morphine was necessary for relief He usually vomited with the attacks There was no history of hemorrhage Physical examination showed him to be undernourished The blood pressure was 166 100 No abdominal tenderness or mass

The laboratory findings were Gastric analysis after an Ewald meal 10 cc free HCl 50 total acidity 73, red blood count 4 2 million hemoglobin 60 per cent Tallquist urine negative, blood Wassermann negative the stools were free of occult blood

The x ray examination showed the stomach to be large and hypertonic There was slow passage of barium through the stoma which was irregular There was delay in the duodenal

loop and in six hours there was barium in the stomach and in the duodenum

Preoperative diagnosis Gastrojejunal ulcer

At operation an indurated ulcer was found on the posterior edge of the stoma involving more than one half of the circumference of the anastomosis A subtotal gastrectomy was done After a somewhat difficult postoperative course the patient recovered completely

The third case falls into the clinical group which may be described as the purely intestinal type in which the pain and distress are referred to the lower abdomen The distress is associated with bloating and poor irregular bowel function There is little relation to food intake and no relief by alkalis The symptoms are apt to be mistaken for those of irritable colon or may even simulate intestinal obstruction In our series of 15 cases one was so classified

Case III—Clinic No 12 152 was a white male dentist aged sixty years Fourteen years before admission to the clinic he had had a gastro-enterostomy Previous to the operation he had had several years of moderately severe ulcer symptoms He was practically symptom free for nine years after the operation Then for five years he had increasingly severe dyspepsia characterized by shifting lower abdominal pain different from the original ulcer pain There was bloating and persistent soreness throughout the abdomen The bowel function was very poor and required an enema daily

On physical examination he was found to be poorly nourished and arteriosclerotic There was tenderness localized just left of the umbilicus The blood pressure was 128 80

The laboratory findings were Gastric analysis after an Ewald meal 70 cc free HCl 50 total acidity 64 the red blood count 4 8 million hemoglobin 85 per cent Tallquist blood Wassermann negative the urine was normal and the stools showed no occult blood

The x ray examination showed no indirect or direct signs of pathology at the stoma

A diagnosis of irritable colon was made and he was treated for this with some relief, but he complained after leaving the hospital of pain in the left lower quadrant radiating to the left testicle. Prostatic massage seemed to relieve this but one year later he had a return of severe pain with a palpable mass in the left abdomen. He was operated upon elsewhere and a perforation at the gastro enterostomy stoma was found. Death followed due to peritonitis.

The fourth and fifth cases fall into the clinical group which may be described as the 'complicated type' the fourth because of obstruction and the fifth because of a gastrojejunal colic fistula. Hemorrhaging cases are also included in this group. In our series of 15 cases 5 were so classified.

Case IV—Mr A C was a male Italian shoe worker aged twenty three years. Two and a half years before he had had a gastro enterostomy done for duodenal ulcer of several years duration. He was practically symptom free after the operation until five weeks before admission. During this time he had cramplike upper abdominal pains coming on soon after eating and persisting several hours. He frequently vomited large quantities of food several hours after eating. Some relief was obtained from alkalis. The bowel function was normal.

The physical examination was essentially negative.

The laboratory findings were: Gastric analysis after an Ewald meal showed no free HCl; red blood count 5.1 million, hemoglobin 90 per cent, Tallquist; blood Wassermann negative; the urine was normal and the stools were not recorded.

The *x* ray examination showed complete closure of the stoma and also obstruction of the afferent jejunal loop at the site of the anastomosis.

Preoperative diagnosis: Gastrojejunal ulcer.

At operation an ulcer crater was found on the anterior wall of the afferent loop of jejunum just beyond the stoma. A lysis of the gastro enterostomy was done and the patient made a good recovery.

Case V —Clinic No 22 234 a white male laborer aged thirty seven years. Nine years before admission to the clinic the patient had a gastro-enterostomy done for a duodenal ulcer of one years duration. He was completely relieved but during the last three or four years he had occasional cramplike pains in the left lower quadrant. His bowels had always been regular until two weeks before admission when he began to have diarrhea and some vomiting. The diarrhea consisted of from four to eight large watery stools daily with considerable abdominal cramps. Eating aggravated the diarrhea. He complained of a bad taste in his mouth.

The physical examination was essentially negative except for slight tenderness in the left abdomen.

The laboratory findings were. Gastric analysis after an Ewald meal 25 cc free HCl 12 total acidity 24 red blood count 4 3 million hemoglobin 90 per cent. Tallquist blood Wassermann negative urine normal one stool was negative for occult blood.

The x ray examination showed a large fistulous tract between the colon and the stomach. This was demonstrated best by means of a barium enema which was seen to pass directly from the colon into the stomach and jejunum at the site of the gastro enterostomy.

Preoperative diagnosis. Gastrojejunocolic fistula.

At operation a fistula between the transverse colon and the jejunum was found and excised. A lysis of the gastro enterostomy with end to end anastomosis of the jejunum was done.

Death occurred postoperatively from leakage and peritonitis.

SUMMARY

The clinical laboratory and roentgenological findings which aid in the diagnosis of gastrojejunal ulcer have been evaluated and discussed.

Five cases who demonstrate the various manifestations of the disease have been abstracted.

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The physical examination was essentially negative except for slight tenderness in the left abdomen

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Preoperative diagnosis Gastrojejunocolic fistula

At operation a fistula between the transverse colon and the jejunum was found and excised A lysis of the gastro-enterostomy with end-to-end anastomosis of the jejunum was done

Death occurred postoperatively from leakage and peritonitis

SUMMARY

The clinical laboratory and roentgenological findings which aid in the diagnosis of gastrojejunal ulcer have been evaluated and discussed

Five cases who demonstrate the various manifestations of the disease have been abstracted

NOTES ON CARCINOMA OF THE STOMACH

Sara M. Jordan and N. Alfred Hill

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In a disease as insidious and as ravaging as cancer of the stomach statistics upon its various phases are usually of interest and it is for this reason that certain data from a study of 153 cases are presented

The medical profession as well as the laity are frequently impressed by the hopelessness of the situation with regard to cancer of the stomach when it attacks their own patients or their own friends. Comments are often made upon the difficulties in evaluating symptoms and differentiating the insignificant ones from the ominous ones and it is not infrequently stated perhaps with consolatory or condonative implication that even if an early diagnosis had been made the disease is so rapidly metastatic that not much is gained by removal of the lesion itself. Lest honest efforts toward the early detection of this lesion flag it seems worth while to attempt a classification of symptoms and a determination of exactly what may be regarded as an ominous symptom and furthermore an opinion as to what can be expected if such an ominous symptom receives early attention and results in detection of an early lesion

With these thoughts in mind the writers of this paper studied the histories of 153 cases of cancer of the stomach and classified them into four groups. These are

Group I   Forty seven cases whose diagnosis was made early enough to have the lesion removed by partial or total gastrectomy

Group II   Twenty nine cases in whom only a palliative change in the course of the alimentary stream could be made—gastrostomy gastro-enterostomy jejunostomy

.

regarded as including the earlier cases (since the removal of the lesion was possible in these cases) and the other groups as progressively later it will be seen that the ratio of those under fifty to those over fifty in Group I was a little less than $\frac{1}{2}$ 1 while this ratio in Groups II and III is about $\frac{1}{3}$ 1 and in Group IV it is about $\frac{1}{4}$ 1 In some cases this may indicate that the greater age was a contraindication to operation but it probably also means at least to some degree that the younger person heeds his symptoms at an earlier stage

The importance of the duration of symptoms is generally considered vital by all who refuse to be fatalistic in the matter

Table 2

Ages of 33 Cases of Carcinoma of the Stomach

	Between 26yrs and 36yrs	Between 36yrs and 41yrs	Between 2 & 3 yrs	Between 6 & 9 yrs	On over 10yrs of 79 yrs	Over 80yrs
Group I (64 cases in min no of ...)	5	2		3		
Group II (No cases with patient & operation)	3	4				
Group III (No cases in a place only)		6	2			
Group IV (23 cases & period)	2	7	3	10	4	
Totals	9	29	33	50	6	

of cancer of the stomach It is generally assumed that the length of the history indicates the progress of the lesion though consideration of two other functions must not be neglected First the varying degree of sensitivity to discomfort found in different individuals and this is usually associated with accuracy of memory of such discomfort and therefore leads to different degrees of veracity in the relating of the history second, the varying degree of malignancy in the lesion and the reaction of the individual to it However in spite of these uncontrollable variants the length of the period of time between the moment when the patient is first conscious of something wrong and the moment when the diagnosis of cancer of the stomach is made,

Group III Thirty cases in whom only exploration could be done

Group IV Forty six cases in whom no operation was done

The question frequently arises in the minds of physicians as to when a patient should be urged to have a complete gastro-intestinal study involving expenditure of considerable time and money For example should a man of thirty eight, presumably not yet in the so-called cancer age with a simple complaint of *gaseous eructation or epigastric distress of only six weeks* duration be allowed to go out of the office with an explanation of symptoms based on the fluctuations of the stock market some directions as to diet and a prescription for some alkali relief or should he be advised to have an exhaustive study of his alimentary tract from mouth to rectum? As soon as the physician who is in doubt as to what he should do in such a case has decided for himself that it is worth while to detect an early cancer of the stomach he has no further doubt as to what his course in such an individual case is to be The three points in such a case which bear upon the present study are the age of the patient the duration of his symptoms and the character of his symptoms For comparison with the hypothetical case in question the data regarding age duration of symptoms and character of symptoms in these cases of cancer of the stomach are presented The series consisted of 86 men and 67 women

Table I shows the ages of 152 cases with cancer of the stomach

While it is true as was to be expected from general impressions regarding the cancer age that the greatest incidence occurs in the years between forty and fifty nine 53 per cent of this series being in this group 36 per cent are between sixty and seventy years and 4 per cent are over seventy years It is of interest to note that 9 cases or 6 per cent are between thirty and thirty nine years This incidence is surely sufficiently large to change a rather widespread opinion that the cancer age begins at forty years The ratio of those under fifty to those over fifty varies in an *interesting manner in the four groups* which have been arbitrarily made in this study If Group I is

regarded as including the earlier cases (since the removal of the lesion was possible in these cases) and the other groups as progressively later it will be seen that the ratio of those under fifty to those over fifty in Group I was a little less than $\frac{1}{2}$ 1 while this ratio in Groups II and III is about $\frac{1}{3}$ 1 and in Group IV it is about $\frac{1}{4}$ 1 In some cases this may indicate that the greater age was a contraindication to operation but it probably also means at least to some degree that the younger person heeds his symptoms at an earlier stage

The importance of the duration of symptoms is generally considered vital by all who refuse to be fatalistic in the matter

Table I

Age of 32 cases of Carcinoma of the Stomach

	Between 20 yrs and 30 yrs	Between 30 and 40 yrs	at age 50 2 yrs	Between 50 & 60 yrs	over 60 yrs of 70 yrs	Grand total
Group I (Age 50 b too ill or b No op at a)	5	2	7	3		
Group II (73 cases worth fell on a age above)	3	4	7	9		
Group III (does not do b ill not op only)						
Group IV (to prefer)	2	7	3	10	4	
Total		29	3	59	6	

of cancer of the stomach It is generally assumed that the length of the history indicates the progress of the lesion though consideration of two other functions must not be neglected First the varying degree of sensitivity to discomfort found in different individuals and this is usually associated with accuracy of memory of such discomfort and therefore leads to different degrees of veracity in the relating of the history second the varying degree of malignancy in the lesion and the reaction of the individual to it However in spite of these uncontrollable variants the length of the period of time between the moment when the patient is first conscious of something wrong and the moment when the diagnosis of cancer of the stomach is made,

is a matter of serious consideration A study of this phase of the subject resulted in the data presented in Table II

It is seen in the summarizing data at the right of this table that of the 47 cases of Group I (the early lesions which were removable) 30 or almost 64 per cent had a history of six months or less while only 17 or 36 per cent had a history of over six months A slightly lower percentage (61 per cent) of histories of six months or less was found in Groups II and III A more definite contrast is seen in the late lesions of Group IV where 52 per cent only had a history of six months or less Of a less encouraging note is the observation that Group IV, the presumptively late group has almost the same percentage of cases whose history is under two months and under three months as

Table II

		Duration of history before B rel was Sought										
	Und	1 m	2 m	3 mos	4 m	5 m	6 m	9 m	1 yr	2 yrs	6 mos or less	6 or more
Group I (47 cases with removed growth)	10	8	4	3	8	5	2	4			30	17
Group II (45 cases with pylorus in operation)	8	3		4	3	2	3				18	12
Group III (20 cases in exploratory op)	3		4	8	4	2	4				13	7
Group IV (46 cases in general)	9	3	2	7	7	5	3				24	22

Group I the presumptively early group It may be concluded from this phase of the study that although the length of history has some prognostic significance it is not as great as might be assumed a fact which is probably due to the uncontrollable variants mentioned above The most important conclusion to be drawn from a study of this phase of the subject is in the opinion of the writers that although the duration of the history has some diagnostic significance it does not have the unlimited importance that one might expect of it

The character of the symptoms of cancer of the stomach is the next point to be considered There are two facts about cancer of the stomach which are also facts about almost any other gastro intestinal disease The first that it may come to

the attention of the patient only by general symptoms which point toward trouble in the alimentary tube, but give no clue

Table III

Outpatient Symptoms which caused patients to consult us if in 143 cases of Carcinoma of Stomach

	Digestive soreness	Vomiting	Loss of appetite or weight	Pain	Constipation	Anemia Exhaustion	Jaundice	Pain by gas	Pain by gas	the way it hurt	Pain	Swelling of abdomen	Shock	Bleeding from bowel
Group I (Obstruction present)	12	2	4	3		2	4	3	1	1	2	1		
Group II (Cases of negative symptoms)	5	2	5			2	5		6	1	0	0	2	
Group III (Cases with appendicitis)	3	1	1	3		1	4		6		0	0	2	1
Group IV (Misc.)	4	1	7	2		1	7		4	1	1	1	1	1
Totals		6	17	10		6	20		7					

as to the exact location of this trouble e g, abdominal distention The second that directly misleading symptoms may

occur which unless followed down, lead to an erroneous diag nosis, e g, constipation It is, of course, a well known fact that when loss of weight and appetite are the obvious and outstanding symptoms to the patient, the lesion has progressed to a point where it must certainly be assumed that metastases have oc curred, even though they are not palpable or roentgenograph ically visualized These two symptoms may, however, be brought to the attention of the patient by the questions of the examiner even in cases where they are not the outstanding symptom The other symptoms regarded usually as less ominous may be listed as epigastric distress gaseous eructations abdominal dis tention, vomiting, fatigability Those directly misleading are constipation, diarrhea, and jaundice It was felt that a classifi cation of the outstanding symptoms, which in each case caused these patients to seek help, would be of value, and this has been done in Table III, in which 142 cases were studied

It is noteworthy that distress in the epigastrium, in other words a localizing symptom was the chief complaint in 61 cases or 43 per cent The disquieting fact about this apparently significant fact is that since this epigastric distress and fulness is likewise characteristic of other gastro intestinal pathology such as peptic ulcer gallbladder disease or functional disturb ances it may and often is explained on these relatively innoc uous grounds and the actual malignant cause ignored If the groups are considered as indicating relative periods of develop ment of the lesion Group I which may then be regarded as that of the earlier lesions has epigastric distress as its chief symptom in more than half the cases while the percentage of cases showing this chief symptom in Groups II and III is 43 per cent and in Group IV that of the relatively late lesions it is only 30 per cent On the other hand the converse relation ship is observed in the symptoms of loss of weight weakness and anorexia, the text book symptoms of alarming import These are found in 15 per cent of Group I 21 per cent of Groups II and III, and 28 per cent of Group IV Vomiting a symptom usually regarded as of serious import was found in 15 cases more frequently in Groups II and III than in the earlier or later

les ons Gaseous eructations a symptom frequently given only casual attention by the physician was the complaint for which 8 of the 143 cases sought help and 3 of these 8 were in the group having late les ons Distinctly misleading symptoms constipa

Table IX present and to d)

t on diarrhea and melena were the chief complaints in 11 of these cases 5 of which were in Group I 3 in Groups II and III and 1 in Group IV

The finding of a palpable mass in a patient suspected of

having carcinoma of the stomach often has a depressing effect upon the mind of the diagnostician or surgeon with regard to the ultimate prognosis In 40 cases of Group I, this was found in 12 (30 per cent), in 57 cases of Groups II and III in was found in 19 (33 per cent), and in 46 cases of Group IV in 21 (45 per cent), these data showing that the prognosis as to operability is perhaps somewhat proved if a mass is present

It is of some interest to note that 8 cases of 40 in Group I had free hydrochloric acid by analysis of gastric contents after a test meal, while only 2 of Groups II and III were found to have it

Reference was made in the early part of this paper to the value of early diagnosis of the stomach—whether it is worth while to attempt to win the struggle against the force of the lesion itself and its potential metastases Any decision on this point presupposes an agreement as to the value of any prolongation of life beyond a time when it would otherwise have been ended by disease, an agreement which is usually uncontested With this point settled the cases of this series were studied as to the duration of life after the diagnosis of carcinoma of the stomach was made Again in this phase of the study the groups as previously described were used and Table IV shows that of 74 cases operated upon and followed 20 of the 46 of Group I in whom the lesion was removed lived more than a year, while in Groups II and III, there were none who survived a year and the large majority died in less than six months

The fact that of the 16 living members of Group I, has outlived his operation by nine years 1 by six years 1 by five years 2 by three years and 3 by two years offers sufficient encouragement to the surgeon and the internist to continue the search for and the treatment of early carcinoma of the stomach, in spite of the difficulties of diagnosis and the inevitable high mortality of the radical removal of the lesion

SUMMARY

One hundred fifty three cases of cancer of the stomach were used in a study of the age incidence, duration of symptoms,

character of symptoms, duration of life when the lesion is removed and when it is not removed

The 'cancer age" must include the thirties as well as the decades beyond that point—the greatest incidence however occurring in the years between forty and sixty

The duration of symptoms, while undoubtedly an important factor in prognosis is shown by these cases to be of less relative importance than was assumed before the study was made   A difference of 12 per cent was noted between Group I (early lesions) and Group IV (late lesions) in the number of cases giving histories of under six months

The character of the symptoms of cancer of the stomach may be heterogenous, the text book syndrome of loss of appetite, weight, and strength being more commonly found in the late lesions than in the early ones, while symptoms characteristic of many other gastro intestinal lesions and distinctly mis leading symptoms characterized some of the early lesions

The definite increase in life expectancy shown in the early cases of this series who had successful removal of the lesion, silences, in the opinion of the writers all argument as to the fu tility of early diagnosis of cancer of the stomach

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THE IMPORTANCE OF FUNCTIONAL TRANQUILLITY IN ABNORMAL MECHANISM OF THE DIGESTIVE APPARATUS

SARA M JORDAN

THE long title of this short presentation probably requires at the outset an explanatory note By functional tranquillity it is the intention of the writer to indicate an absence of any disturbing factor in the function of the digestive apparatus and by abnormal mechanism is meant an arrangement of the parts of the digestive apparatus which varies from that usually found in normal individuals Such abnormal mechanisms may be the result of surgical intervention as in gastro enterostomy or pylorectomy or may be the result of congenital or acquired anomalies in the position of certain organs as in diaphragmatic hernia The cases to be presented will illustrate these two types of conditions The points which the writer wishes to stress are the fact that under such abnormal conditions of mechanism disturbances of digestive function produce more serious symptoms than when the arrangement of the various parts of the digestive apparatus is normal and conversely that even with as radical an abnormality as the presence of practically the entire stomach in the chest cavity through diaphragmatic herniation there can be freedom from symptoms when digestive function is carried on tranquilly

The first case is that of a woman who when first seen in 1929 was fifty seven years of age She was admitted to the hospital because of an attack three days previously of gripping pain in the right upper quadrant below the costal margin The pain lasted four hours until relieved by morphia and recurred thirty six hours later with slightly less intensity and was again relieved by morphine Nausea and vomiting together with rumbling and gurgling throughout the abdomen attended the pain There

howed a very large diaphragmatic hernia involving practically
he entire stomach (Fig 223)   The barium meal passed down
ard to the lower end of the esophagus which appeared to turn
pon itself upward to the cardiac end of the stomach which except
or the pyloric sphincter lay completely above the diaphragm
The colon showed no abnormality except some diverticula
The arch of the aorta showed a large plaque   The diagnosis was
now diaphragmatic herniation of the entire stomach, alveolar
abscesses and acute functional gastro intestinal disturbance
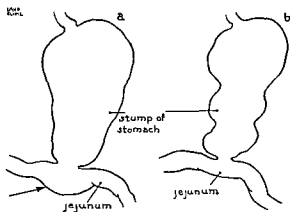
Fig 224—Showing two diagrams (a) a stump of stomach after pylo
rectomy emptying by dumping into a dilated jejunum (b) a stump of
stomach after pylorectomy emptying with normal peristalsis into jejunum
of normal caliber

Surgical treatment of this hernia was considered, but con
sidered inexpedient because of the patient s weight and the
x ray evidence of aortitis   With rest application of heat to the
abdomen the use of atropine and a very bland diet gradually
increased in variety, the patient became and remained symptom
free   In the two and a half years since her hospitalization, she
has had no recurrence of abdominal symptoms except occasional
distension and epigastric distress after large meals, after the use
of carbonated drinks ice cold food or drink, or the use of
cathartics   Apparently with the omission of all irritants,

was no history of previous attacks of such severe pain but the
patient had for many years had attacks of indigestion gaseous
distension, nausea vomiting profuse sweating and mild symp-
toms of collapse The past history was otherwise negative
Physical examination showed a somewhat obese woman (height
5 feet 6 inches weight 170 pounds) who was obviously suffering
from acute pain in the right upper quadrant radiating to the
back Blood pressure and urinary findings were normal There
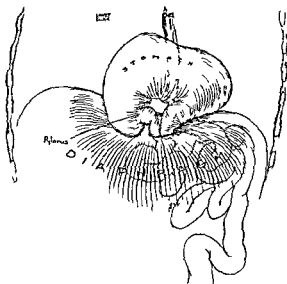
Fig 223 —Showing diagram of x ray of complete diaphragmatic herniation
of stomach Case described in text

was an elevation of temperature to 100 F which lasted for
four days Except for suspicious teeth some gaseous distension
of the abdomen and claposage of the left chest heard with deep
respiration there were no abnormal physical findings The
impression from history and physical examination was that this
patient had gallbladder disease The gastro intestinal study was
begun with an intravenous Graham test which showed a gall
bladder of normal size density and function Further study

sion he was driving and had to pull up to the curb until the attack was over Relief usually occurred after vomiting There had been four such attacks the first one occurring within a year after an operation in which gastro enterostomy and excision of a gastric ulcer was done The preoperative symptoms were characteristic of ulcer A duodenal ulcer had also been found at this operation Following the operation the patient was symptom free for about six months but then began to have some nausea and sudden regurgitation of bile at times but the attendant prostration above described was present only during the attacks of the past six months His past history except for the operation described above and an inguinal herniotomy was negative Physical examination was essentially negative Gastro intestinal study showed achlorhydria A gastro enterostomized stomach with a normal filling of the pyloric end of the stomach and of the duodenal bulb was visualized There was no tenderness over the stoma The opaque meal passed very rapidly out of the stomach and the head of the meal was at the splenic flexure in four hours The gallbladder reacted normally to an intravenous Graham test The patient gave a history of irregular food habits and the use of all types of food including fried foods and pastries and had used cathartics of various kinds He was put on a careful regime of bland diet no cathartics moderate smoking and in the two years and eight months since he was first seen he has had no attack like those previously described There have been occasional very slight disturbances miniatures of the original attacks which he has always been able to ascribe to some disturbing variation in diet It is apparent that in this case with the preservation of normal function in the gastro intestinal tract and the prevention of abnormal spasm and distension the abnormal mechanism of gastro enterostomy produces no un toward symptoms but with disturbances in function symptoms of disturbed mechanics (nausea and vomiting of bile) and of disturbed vasomotor equilibrium appear

These 2 cases are examples of a group of cases of this type—patients with diaphragmatic hernia and previous symptoms who

thermal, chemical, and mechanical from her diet, with normal function as evidenced by normal stools and the absence of distension, this patient has no consciousness of abnormal mechanism, whereas, with disturbed function, she has symptoms varying from simple indigestion to acute colic, probably produced by incarceration above the diaphragm of a distended stomach, and distention below the diaphragm of the small and large intestines
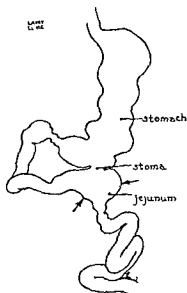

Fig 225—Showing gastro enterostomized stomach emptying with violent peristalsis through stoma into jejunum which shows dilatation at stoma and spasm beyond stoma

The next case is that of a man of fifty two years first seen at the Lahey Clinic in April 1929 His complaint was of attacks of abdominal distress immediately after meals, followed by the sudden onset of nausea giddiness and vomiting Vomitus was usually bile (from 1 ounce to 2 quarts) Limpness of arms and legs, general weakness and collapse, with profuse sweating and "blackness before eyes" attended these attacks On one occa

DYSPHAGIA CLINICAL ASPECTS WITH CASES ILLUS TRATING SOME PATHOLOGIC CONDITIONS OF THE ESOPHAGUS

Walter B. Hoover

Dysphagia is a symptom worthy of the most serious con sideration and may be produced by a lesion which will soon bring death to the patient or by a lesion that may deprive the patient of the pleasures of eating for years and produce partial or complete invalidism And dysphagia may yet be caused by another lesion which will disappear in a few hours and leave no trace of its having been present Thus variable are the lesions that cause dysphagia Too often the cause of dysphagia is not even given thought or only a guess is made or an inferential diagnosis based on an incomplete history and an incomplete examination All too many patients with these symptoms have been told that the trouble is due to nerves due to imagina t on or is globus hystericus Some patients may give up re signed to their fate others in their suffering may wander from one doctor to another until someone takes a real interest and refers them for the necessary work which enables a correct diag nosis The lack of interest in the complaint of dysphagia I believe is due to the failure of the large percentage of practi tioners to grasp its full meaning and unless the cause is obvious on the usual general examination—it is attributed to nerves — while a special examination made by one who knows the causes of dysphagia and the importance of the symptom usually reveals the cause

When a correct diagnosis is made many patients can be readily relieved by the proper treatment and to others a prog nosis of value is available

As has been mentioned the causes are varied and they may be divided into three groups First those due to affections of

are being managed medically and are symptom free as long as their diet and general hygiene is such that there is no irritation of the gastro intestinal tract They all have symptoms if irritation from improper food or cathartics occurs Likewise postoperative cases who have had pylorectomy or gastro-enterostomy, are not infrequently seen with symptoms of disturbed function more severe than these usually are in normal individuals but completely absent when care is taken to obtain normal function Mechanical deformities due to postoperative adhesions also fall in this group of cases and the discomfort frequently ascribed to ' adhesions is in reality due to the exaggerated symptoms of disturbed function in the presence of abnormal mechanism It is therefore important in the opinion of the writer to warn patients who have had gastric and intestinal operations or who have abnormal mechanism due to displacement of parts of the digestive apparatus to use protective measures in the form of diet and general hygiene against any disturbance in normal function

DYSPHAGIA   CLINICAL ASPECTS WITH CASES ILLUS TRATING SOME PATHOLOGIC CONDITIONS OF THE ESOPHAGUS

Walter B. Hoover

DYSPHAGIA is a symptom worthy of the most serious con sideration and may be produced by a lesion which will soon bring death to the patient or by a lesion that may deprive the patient of the pleasures of eating for years and produce partial or complete invalidism And dysphagia may yet be caused by another lesion which will disappear in a few hours and leave no trace of its having been present Thus variable are the lesions that cause dysphagia Too often the cause of dysphagia is not even given thought or only a guess is made or an inferential diagnosis based on an incomplete history and an incomplete examination All too many patients with these symptoms have been told that the trouble is due to nerves due to imagina tion or is globus hystericus Some patients may give up re signed to their fate others in their suffering may wander from one doctor to another until someone takes a real interest and refers them for the necessary work which enables a correct diag nosis The lack of interest in the complaint of dysphagia I believe is due to the failure of the large percentage of practi tioners to grasp its full meaning and unless the cause is obvious on the usual general examination—it is attributed to   nerves — while a special examination made by one who knows the causes of dysphagia and the importance of the symptom usually reveals the cause

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the esophagus itself and they may be enumerated as follows
Congenital defect inflammation of esophagus (a) acute (b)
chronic (c) abscess (d) ulcer (e) specific (1) Tuberculosis (2)
Syphilis (3) Actinomycosis web of the esophagus stenosis of
the esophagus (a) spasmodic (b) cicatricial diverticula of the
esophagus new growth of the esophagus (a) benign (b) malig
nant (c) leukoplakia paralysis of the esophagus foreign body of
the esophagus functional dysphagia   It is this group of cases
that I wish to lay most emphasis upon

Secondly are the conditions external to the esophagus
giving pressure on the esophagus   This may occur at any
place throughout the entire length of the esophagus   Most
common are   Enlarged glands especially syphilitic or malig
nant glands thyroid tumors especially when malignant or
syphilitic periesophageal inflammation aneurysm and benign
and malignant tumors in the neck intrathoracic and mediastinal
also diseased vertebrae and deformity of the vertebrae

Thirdly are conditions which have nothing to do with the
esophagus itself   There are Infections inflammation ulcers
abscesses tumors and gumma about the teeth the jaws the
palate the tonsils the tongue and the pharyngeal wall which
may interfere with function of any of the above named organs
also laryngeal affections as acute septic inflammation and
edema perichondritis tuberculosis syphilis and laryngeal anes
thesia where aspiration occurs also nasal obstruction may cause
difficulty in swallowing and also in postdiphtheritic or other
paralysis that affects the muscles of the jaws cheeks palate
tongue and pharynx and spasm of these muscles due to toxins
or poisons as strychnine tetany and in hydrophobia

How Can the Cause of Dysphagia be Diagnosed?—The
cause of dysphagia can be found by taking a careful history and
making a general physical examination a special examination of
the nose and throat an indirect laryngeal and hypopharyngeal
examination with the mirror x ray and fluoroscopical examina
tions with and without barium mixtures and barium capsules
laboratory examinations including urine blood count Wasser
mann spinal fluids etc as indicated and last but not least by

direct laryngoscopy and esophagoscopy and biopsy with these procedures when indicated. This method of examination is followed in the clinic.

The following cases are reported giving only the more important details in the history and physical findings. These cases are selected to show various pathologic conditions in the esophagus and to permit a brief discussion.

Case I—Mr A C age fifty nine years came to the clinic on April 9 1929 with chief complaint of shortness of breath and pain in the chest. The history of his present illness is that for about seven months he has had a steady dull pain in the chest underneath the sternum. This was made worse by exercise and associated with the pain there has been shortness of breath and a cough. On questioning concerning his appetite and swallowing he stated that his appetite was poor and that so far as he could remember he had never taken anything but liquids and semisolid food. He has always had difficulty when he has taken solid food and solid food seemed to lodge beneath the sternum and is always regurgitated.

On examination he was found to be a poorly developed and nourished man of fifty nine years weighing 112 pounds with a blood pressure of 140/80 and a pulse of 84 regular in rhythm. Special heart examination showed by fluoroscopy the heart to be only slightly enlarged and the pulsations of fair quality. Electrocardiogram showed inversion of the T waves in lead I. A diagnosis was made of angina pectoris and laboratory tests showed the urine to be negative specific gravity 1 010 no albumin or sugar. The nonprotein nitrogen was 40 and blood Wassermann negative. The hemoglobin was 90 per cent. The cells were of normal size and pigmentation. The fluoroscopy of the esophagus showed a dilation of the esophagus from the second dorsal to the lower border of the fifth dorsal vertebrae. Below this there was narrowing and the barium was delayed in passing to the stomach as a portion of the stomach is seen above the diaphragm. Esophageal examination with the esophagoscope showed a narrowing of the middle third of the esophagus through

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which an esophagoscope could not be passed However Jackson
bougies were passed through the instrument, and the esophagus
dilated up to No 24 French With this history of having had
difficulty throughout life, the diagnosis was made of congenital
narrowing of the esophagus and diaphragmatic hernia The
esophagus was dilated from time to time until a No 42 dilator
was passed The last dilation was made on November 30
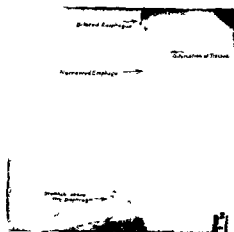1929, and he states that at the present time he can swallow
almost any kind of food

Fig 276—Case 1 Congenital narrowing of esophagus the narrowed
area beginning at bifurcation of trachea Very narrow esophagus below this
region and dilated above The esophagus also shortened and a small portion
of the stomach is drawn through the hiatus above the diaphragm Relieved
by dilatation

Congenital defects of the esophagus are not as rare as is
often supposed—and a large proportion of the cases do not fare
as well as the case reported for frequently there is a complete
obstruction of the esophagus or a communication with the
trachea which results in death in a few days after birth These
have been excellently described by Dr Edward C Vogt, and the
details of diagnosis enumerated when narrowing alone is present
and liquids are taken well No suspicion of any abnormality is

aroused until the child is given a solid diet which is regurgitated. In the above case the diagnosis was never made and in all probability would not have been made if a new complaint had not brought him for examination, yet he has obtained a very gratifying result with a comparatively short course of treatments.

Case II—Case of Mrs. E. R. who entered the clinic with a chief complaint of sick headache associated with nausea and vomiting. She gave a history of having had attacks of headaches since the age of seventeen years. They have become more frequent and are as often now as every two weeks. She has been treated for secondary anemia for years and has had some difficulty in swallowing. She has a rasping sensation in the throat and the swallowing is made better at times by pressure on the left side of the trachea.

Her physical examination showed a poorly nourished woman of forty-eight years weighing 103 pounds. The eyes, ears, nose and throat were negative with the exception of a mild chronic tonsillitis. The heart sounds were clear, the pulse was 92 regular in rhythm and her blood pressure was 140/90. The lungs were clear and the abdomen was normal. The rectal examination was negative. The laboratory report shows no albumin or sugar in the urine. The specific gravity was 1.01, alkaline reaction, nothing found in the sediment. The non protein nitrogen was 40, bilirubin 0.2, and the Wassermann negative. The red blood count was 5,320,000, the white blood count 3700, and the hemoglobin 90 per cent and the smear showed the red cells to be normal in size and shape. The gastric analysis was attempted but the usual aspirating tube would not pass. x-Ray and fluoroscopy study did not reveal any abnormality even though the roentgenologist was told that narrowing was present and it was requested that the narrowing be demonstrated if possible. A direct laryngeal examination was made which showed the larynx within normal limits. On lifting the larynx forward the entrance of the esophagus showed a web with a small opening through which folds of the esophagus could be seen. A No. 18 French dilator was passed with some pressure

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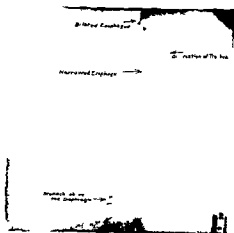1929, and he states that at the present time he can swallow
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forty who appeared as old as sixty She was apathetic weak and apprehensive The teeth were out The ears nose and throat were apparently normal The blood pressure was 144/104 The weight 94 pulse 96 regular in rhythm The heart sounds were of normal quality and the chest was clear The blood picture showed a mild secondary anemia and the blood Wasser mann was negative The fluoroscopical examination of the esophagus showed only a small amount of barium to pass the cricopharyngeus but having once passed this region it passed through the esophagus without further delay The direct laryngoscopical examination showed a normal larynx and in the hypopharynx there were a number of folds of mucous membrane below the cricoid and the opening to the esophagus was very small and somewhat to the right of the midline The crico pharyngeal region was dilated up to No 33 French This dila tion caused some bleeding The esophagus was dilated from time to time until it was dilated up to No 40 French Since then she has been able to eat well and has no difficulty in swallow ing ordinary foods I believe this woman to have had a fibrosis possibly from infection in childhood which she carried for forty years She gave a history of having been to numerous doctors who told her that it was a nervous condition and nothing was to be done about it After a few dilations she was able to sit at the table with other people and eat the same food enjoy herself and gained from 94 to 120 pounds in weight

The following case shows a web and a carcinoma of the esophagus

Case IV —Mrs S W came to the clinic with a chief complaint of difficulty in swallowing History of her present illness dates back to about eighteen years when the difficulty in swallowing began At that time she was scarcely able to take any food as it was immediately regurgitated At that time there was pain in the lower chest after eating but on taking liquids and food pre pared by passing through a sieve she was able to get nearly all the food that she needed She had been advised by a physician that she had a nervous spasm of the esophagus and treatment

Other dilators were then passed until a No 30 French was reached which caused considerable bleeding A 4 mm esophagoscope was passed and the esophagus inspected throughout its course and was found to be normal below the web A diagnosis was made of a web at the upper end of the esophagus and further dilations were done until a No 45 French dilator could be passed Following this there was no difficulty in swallowing

In cases of this kind however dilations must be done from time to time if there is any tendency to a recurrence of the difficulty in swallowing Webs and fibrosis of the upper end of the esophagus is a quite common finding the importance of which is not recognized by the profession at large—and which is missed by a very large percentage of the x ray men who do fluoroscopic examinations of the esophagus The work of Mosher and Jackson should be read by every practitioner who has ever had or will have a patient who may complain of difficulty in swallowing Jackson attributes some of the cases of difficulty in swallowing to spasm of the cricopharyngeus—this I have never been certain of in any case I have seen

The following case is one I believe due to fibrosis of the upper portion of the esophagus—which required five months for dilations up to a No 45 French

Case III—Mrs M M came to the clinic with the chief complaint of difficulty in swallowing Present illness began after a sore throat at the age of nine when difficulty in swallowing was noted At the age of eleven years there was an abscess in the throat which made the swallowing much more difficult This abscess ruptured and the swallowing was somewhat improved She has been able to eat only finely ground food for the past twenty years She has never been able to eat meat without first passing it through a grinder and only vegetables which were finely divided and well cooked In the past year she has only taken liquids and finely strained gruels Swallowing is always an effort She has had considerable distress in her throat for the past six months She has lost 21 pounds in the last year

On physical examination she was an emaciated woman of

forty, who appeared as old as sixty She was apathetic weak,
and apprehensive The teeth were out The ears, nose, and
throat were apparently normal The blood pressure was 144/104
The weight 94, pulse 96 regular in rhythm The heart sounds
were of normal quality, and the chest was clear The blood
picture showed a mild secondary anemia and the blood Wasser-
mann was negative The fluoroscopical examination of the
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the food that she needed She had been advised by a physician
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was not given The inability to eat solids had continued, but
fluids went down relatively freely until four months ago when
she noticed difficulty even with liquid food, and the past few
days she has taken practically no food at all

A general physical examination showed an emaciated little
woman sixty five years old, weighing about 80 pounds The
pulse was 80 and regular The blood pressure was 160 70 The
heart and lungs were negative The abdominal examination
showed the liver enlarged no metastases could be made out
Mucous membranes were markedly pale and saliva was present
in the pyriform sinuses The laboratory findings showed only
a secondary anemia negative Wassermann and negative urine
x Ray and fluoroscopy of the esophagus with a barium mixture
showed an obstruction at the level of the seventh thoracic ver
tebrae with marked narrowing above there was moderate
dilatation A thin mixture would trickle through the stricture
which was irregular and appeared to be about 1½ inches in length
After the appropriate administration of fluid an esophagoscopy
was done and the esophageal examination showed a web oppo
site the third thoracic vertebrae with an opening of about 3 mm
in diameter through which a tube could be passed and it again
met an obstruction 3 inches further down the esophagus Dila
tion was attempted but was unsuccessful and a gastrostomy was
done A diagnosis was made of carcinoma and benign web
This patient later died and a postmortem examination showed the
following findings In the esophagus opposite to the third ver
tebrae there is an old stricture about 4 10 of 1 cm long and with
an opening about 5 10 of a centimeter in diameter There was no
definite surrounding fibrosis and no ulceration of the mucosa
On microscopical examination of this area there was a small area
of ulceration on the surface and a fibropurulent exudate which
extended slightly into the musculature There was lymphocytic
and eosinophilic infiltration On either side of this area of
ulceration the mucous membrane showed hyperplasia with pro
longation and an occasional pearl formation and without a
definite basement membrane and there is a fibrosis with diffuse
lymphocytic infiltration underlying the mucosa Microscopical

diagnosis—epidermoid carcinoma grade I   A second stricture is located at the level of the seventh dorsal vertebrae and about 2 cm long which practically occludes the lumen and is formed by serous indurated gray tissue involving the esophageal wall and the adjacent fat   The mucosal surface is ulcerated   Microscopic section of this region showed advanced epidermoid carcinoma grade II

This case is unusual and presents two distinct lesions of the esophagus both malignant one an advanced epidermoid carcinoma the other an old stricture with early development of epidermoid carcinoma in its mucosa   The old stricture or web no doubt accounts for her symptoms for the past eighteen years and the later development of the carcinoma in the lower portion of the esophagus accounted for the more recent increase in symptoms   This patient had a possibility of relief from her symptoms due to the web but—as for the carcinoma—the treatment could only be palliative   The treatment for carcinoma of the esophagus is diet intubation dilations gastrostomy x ray and radium   the choice of treatment depends on the individual patient

The following case represents a premalignant condition and also a second lesion of the esophagus

Case V—Mrs E M age fifty years came to the clinic November 2 1931 with a chief complaint of a lump in the chest She gave a history of the present illness as follows For the past three years she had had indigestion and belching and last January 1931 began to have sensation of a lump in the chest and difficulty in swallowing She also noticed that about five or six hours after eating her evening meal she would have regurgitation of food eaten at the meal This has become progressively worse In June 1931 she took a month s vacation two weeks of which were spent in bed She lost 16 pounds and the symptoms have persisted and even increased She has had a period of four or five days at a time when she was practically unable to take any nourishment sometimes not even water At other times there is little or no difficulty

was not given The inability to eat solids had continued, but
fluids went down relatively freely until four months ago when
she noticed difficulty even with liquid food and the past few
days she has taken practically no food at all

A general physical examination showed an emaciated, little
woman, sixty five years old, weighing about 80 pounds The
pulse was 80 and regular The blood pressure was 160 70 The
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extended slightly into the musculature There was lymphocytic
and eosinophilic infiltration On either side of this area of
ulceration the mucous membrane showed hyperplasia with pro-
longation and an occasional pearl formation and without a
definite basement membrane and there is a fibrosis with diffuse
lymphocytic infiltration underlying the mucosa Microscopical

The heart sounds were of good quality Examination of the nose mouth pharynx and larynx was negative except for carious teeth tartar and retraction of the gums Examination of the abdomen showed some tenderness over the gallbladder region and at the substernal notch Pelvic examination was negative Rectal examination showed external and internal hemorrhoids Fluoroscopy of the esophagus showed a stricture at the junction of the middle and upper thirds At the lower end of the esophagus the cardia was seen above the diaphragm and a portion of the stomach was also above the diaphragm Due to the regularity of the outline a diagnosis was made of stricture of the esophagus most probably benign and diaphragmatic hernia Laboratory report showed the urine negative and the blood Wassermann negative An esophagoscopy was done which showed the stricture just below the junction of the middle and upper thirds of the esophagus and the mucous membrane in this area was shown in folds that did not dilate easily With some pressure a 9 mm esophagoscope passed This area had a characteristic appearance of leukoplakia and a specimen from this area was removed for microscopical study The scope was then passed through the lower end of the esophagus where the stomach mucosa was seen before the level of the diaphragm was reached The esophagus and stomach were ballooned and a portion of the stomach was above the diaphragm

The treatment in this case has been dilation the placing of filtered radium at the area of leukoplakia and having her sleep with the head elevated so that there will be less regurgitation of the food especially when she lies down at night A recent article by Dr George S Sharp* shows the etiologic relationship between leukoplakia of the esophagus and carcinoma of the esophagus Very little has been written on this subject and one might assume that leukoplakia here should be treated as leukoplakia elsewhere in the body with the exception of the difficulties one has in treating esophageal conditions

Case VI—Mr A P s chief complaint was difficulty in swal

* Supplement to American Journal of Cancer page 7079

Fig 227 —Case V Leukoplakia of esophagus and diaphragmatic hernia showing barium capsule in leukoplakic area above which is a barium mixture
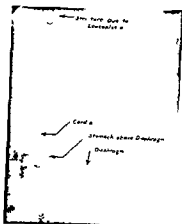
Fig 228 —Case V Leukoplakia of esophagus and diaphragmatic hernia showing stricture of leukoplakic area the narrowing of the cardia and a portion of the stomach above the diaphragm

General physical examination showed a fairly well developed and nourished woman of fifty years weighing 144 pounds The pulse rate was 84 regular in rhythm, blood pressure 120/80

tion of the esophagus both by fluoroscope and plate showed a diaphragmatic hernia and above the hernia the esophagus was narrowed but was apparently flexible There was some delay in the passage of fluid into the stomach The stomach was high regular in outline with normal peristalsis The duodenal cap appeared to be smooth The x ray diagnosis was diaphragmatic hernia and stricture of the esophagus

Direct esophageal examination was made an i the upper portion of the esophagus was dilated About 3 inches above the usual position of the cardia a narrowing of the esophagus was encountered which was quite firm and fibrous There was an irregular area on the posterior wall which bled without having been touched This had the appearance of an ulcer A specimen was taken from this ulcer for microscopical examination A soft flexible Jackson bougie was used to dilate the narrowed area The microscopical examination showed chronic inflammation with no evidence of malignancy The laboratory report showed the blood Wassermann to be negative and secondary anemia was present The urine showed some casts

The final diagnoses as far as the esophagus was concerned were Dilatation of the esophagus stricture of the esophagus ulcer of the esophagus and diaphragmatic hernia The subsequent treatment has been dilation of the stricture and ulcer treatment In the past two years since treatment was begun he has gained weight has felt better his diet is still somewhat limited so that he does not eat coarse or uncooked food and dilations are still being carried on at bimonthly intervals

Case VII—Miss Y D gave a chief complaint of difficulty in swallowing The present illness dates back to trouble two and one half years ago when at times she would have difficulty in swallowing and at other times she would be entirely free from symptoms For the past month she has had great difficulty in swallowing both solids and liquids with considerable pain in the chest under the sternum and when she tries to force food down she frequently regurgitates She often has noticed a gurgling sound in the throat when she lies down

lowing for one and one-half years Following an attack of the grippe two and one half years ago he began having difficulty in swallowing, this has gradually increased until now he cannot eat solid food Cooked cereals and purees will pass Solid food causes a sensation of pressure under the sternum as though it were stuck and would not pass to the stomach for several hours or there would be regurgitation without nausea of food that had been eaten some time previously Liquids passed fairly well He has on one occasion regurgitated a small amount of

Fig 2 9 —Case VI Ulcer of esophagus proved by biopsy and diaphragmatic hernia Narrowed area treated by dilation and ulcer treated by ulcer management Improved but still following treatment after two years

blood Previous to the difficulty in swallowing he had gastric distress which was relieved by food He lost 15 pounds in weight in the past twelve months

Physical examination showed a poorly developed and nourished man of seventy five years weighing 120 pounds The pulse rate is 76 and regular in rhythm and the blood pressure was 140/90 and there were no signs of heart failure

The vessels showed sclerosis there were no important findings in the abdomen and the reflexes were sluggish x Ray examina

tion of the esophagus, both by fluoroscope and plate, showed a diaphragmatic hernia, and above the hernia the esophagus was narrowed but was apparently flexible. There was some delay in the passage of fluid into the stomach. The stomach was high, regular in outline, with normal peristalsis. The duodenal cap appeared to be smooth. The x ray diagnosis was diaphragmatic hernia and stricture of the esophagus.

Direct esophageal examination was made and the upper portion of the esophagus was dilated. About 3 inches above the usual position of the cardia a narrowing of the esophagus was encountered which was quite firm and fibrous. There was an irregular area on the posterior wall which bled without having been touched. This had the appearance of an ulcer. A specimen was taken from this ulcer for microscopical examination. A soft flexible Jackson bougie was used to dilate the narrowed area. The microscopical examination showed chronic inflammation with no evidence of malignancy. The laboratory report showed the blood Wassermann to be negative and secondary anemia was present. The urine showed some casts.

The final diagnoses as far as the esophagus was concerned were Dilatation of the esophagus stricture of the esophagus ulcer of the esophagus and diaphragmatic hernia. The subsequent treatment has been dilation of the stricture and ulcer treatment. In the past two years since treatment was begun he has gained weight, has felt better, his diet is still somewhat limited so that he does not eat coarse or uncooked food and dilations are still being carried on at bimonthly intervals.

Case VII.—Miss Y. D. gave a chief complaint of difficulty in swallowing. The present illness dates back to trouble two and one half years ago, when at times she would have difficulty in swallowing, and at other times she would be entirely free from symptoms. For the past month she has had great difficulty in swallowing, both solids and liquids, with considerable pain in the chest under the sternum and when she tries to force food down she frequently regurgitates. She often has noticed a gurgling sound in the throat when she lies down.

A point in her social history is of interest in that she is a
factory worker, and has been separated from her family and
living by herself, and has worried considerably because of
irregular work and lack of income Her father died about six
months ago and the remaining family objected to her suitors

Examination showed an apparently well girl of twenty three
slightly undernourished weighing 102 pounds with a pulse
rate of 84 regular rhythm and blood pressure of 108/72 with
out significant physical findings The laboratory findings were

Fig 240 Case VII Card ospasm Esophagus showing narrowed area
due to card ospasm relieved by dilation

all normal and the x ray and fluoroscopical examination showed
dilatation in the upper portion of the esophagus with the barium
being held up for a short time opposite the sixth dorsal ver
tebra The lower third of the esophagus then filled and ap
peared smooth in outline but dilated to one and one half times
normal The esophagus tapered as it passed through the dia
phragm and at no time did the cardiospasm relax sufficiently to
allow the barium to pass rapidly into the stomach An esoph
ageal examination was made by passing the esophagoscope and
a dilated esophagus was found with considerable debris which

was removed There was no evidence of ulceration throughout
At the cardia the esophagus was narrowed but an esophago
scope could be readily passed into the stomach A diagnosis of
cardiospasm was made and a Plummer dilator used

She was discharged and had practically no symptoms for
eleven months at which time there was again a disagreement
over her suitor difficulty in swallowing resulted and the cardia
was again dilated

Case VIII—Mr L P S retired age sixty seven years
came to the clinic stating that he had a diverticulum He gave
a history of a present illness extending back thirty six years at
which time he began to have difficulty in swallowing At that

Fig 231—Case VIII Fibrosis of the lower end of esophagus many
years standing with marked dilatation of thoracic esophagus relieved by
dilatation with a Plummer dilator

time cold drinks seemed to stick in the throat and later would
pass into the stomach Shortly after this he began having re
gurgitation of food especially when lying down He has lived
on semisolid and liquid diet during the past thirty six years

He was told he had a diverticulum twenty-eight years ago and that no treatment could be safely instituted Since that time he has washed the esophagus with a stomach tube three times a day His weight has varied greatly during this period of time and his present weight is 143 pounds His best weight has been 180 pounds In using the stomach tube he often gets as much as 24 ounces from the esophagus

x Ray and fluoroscopy of the esophagus showed a greatly dilated esophagus with a small opening which passed to the stomach The general physical examination showed a fairly well nourished man of sixty seven years, weighing 143 pounds with a pulse rate of 72 regular in rhythm and blood pressure of 170 130 The heart was not particularly enlarged, the sounds were of good quality The chest was emphysematous with rales at both bases The abdomen was negative, and the extremities negative except for ankylosis of the right elbow Laboratory, urine and blood negative Wassermann negative An esophagoscopy was done, and an attempt was made to dilate the stricture through the esophagoscope, but was unsuccessful A Plummer dilator was passed, and the stricture was dilated From this procedure he obtained his first relief from difficulty in swallowing in thirty-six years This I believe to be a case of fibrosis of the lower end of the esophagus, while the case previously reported was probably spasm of the lower end of the esophagus

Case IX—Mr P J F came to the clinic with a chief complaint of throat trouble and difficulty in eating and drinking Present illness began ten or more years ago and had gradually and slowly become worse There had been no pain of any kind There was little trouble if he ate very carefully and slowly, taking only small pieces He hears noises in his neck at night and especially when eating or drinking also when he lies down at night, he will often spit up some particles of food He gave a history of having seen many doctors without an explanation of his condition and without improvement Tonsillectomy was done five years ago for his throat trouble

Physical examination showed a fairly well developed and nourished man of sixty four years There were no important findings in the eyes, ears, nose, and throat except that there was some mucus held in the hypopharynx and a gurgling sound was made on swallowing Examination of the chest shows some emphysema and the blood vessels were slightly sclerosed but not marked for his age The abdomen and extremities were negative Urine was normal the specific gravity was 1 011, no albumin or sugar, no casts The blood Wassermann was negative

Fig 232 Case IX Esophageal diverticulum of ten years duration relieved by two stage operation (oblique view)

Fig 233 — Case IX Esophageal diverticulum of ten years duration relieved by two stage operation (anteroposterior view)

The red blood count was 4 850 000 hemoglobin 90 per cent, white blood count 9250 The x ray and fluoroscopical examination showed a diverticulum of the upper end of the esophagus which would well account for all his symptoms An operation was advised and the first stage operation was done on August 22, 1930 On September 3d the second stage operation was done There was no general reaction and his condition was good A small sinus developed after the operation and a secondary operation was necessary to close the sinus This was done on

December 8, 1930 Since this time he has had no further diffi
culty in swallowing

Case X.—Master P F , age two years was brought to the
clinic with the statement that he had choked and was unable
to swallow solid food, and liquids only with difficulty His
history was negative, with no childhood diseases He had
always been a healthy boy On the day of admission while
playing he choked quite severely and cried Following this there
was difficulty in swallowing fluids and he was unable to take
semisolid food His grandmother had seen him playing with a

Fig 234 —Case X   A penny in esophagus

penny previous to the choking spell and suspected that he had
swallowed the penny Physical examination showed a well
developed and nourished boy of two years in apparent comfort
No abnormal physical findings An x ray revealed a coin in the
upper portion of the esophagus With a 6 mm esophagoscope
the penny was easily visualized in the upper portion of the
esophagus just below the cricopharyngeus muscle, and was
grasped with forceps and withdrawn This was a very simple
case without any complications and most cases of this kind
where there are no penetrating points or cutting edges if diag
nosed and removed early will have no complications The his
tory which was present in this case is often lacking because the

parent or an adult may not have been present at the time the accident occurs and there may be very little or no symptoms for a considerable time after the accident occurs and secondary inflammatory changes appear about the site of the foreign body which may go on the cellulitis and abscess which give a very grave prognosis Some nonopaque foreign bodies may be visualized by the swallowing of barium mixture which gives an outline to the foreign body or shows a region of obstruction of the lumen of the esophagus

Foreign bodies with penetrating or cutting edges are much more likely to produce complications early and offer a more difficult problem for their removal Practically every child at some time or another swallows a foreign body which may pass through the gastro intestinal tract without symptoms and the only knowledge of its having been swallowed is the finding of the article in the stools Children often swallow caustics due to carelessness and lack of knowledge of the danger of caustics on the part of the parent or guardian Manufacturers who do not place the label of poison upon the package containing the products are responsible Lye is to a great extent the chief offender for this unfortunate state of affairs and I have treated children with strictures of the esophagus resulting from lye burns The work of Gabriel Tucker is classical in the treatment of this condition and the monumental labors of Chevalier Jackson in preventing this frequent tragedy through lye legislation is worthy of the greatest honor that can be shown any man The greater portion of burns of the esophagus due to caustics if not fatal heal leaving scars which contract Producing a sten osis difficulty in swallowing occurs both during the acute con dition and may be even more severe when contracture of the scars takes place Gastrostomy often becomes necessary to pre vent starvation

In conclusion reviewing the cases reported one will note that it is not uncommon for more than one lesion to be present in the esophagus that the complaint of difficulty in swallowing is associated with each of them In view of the possible patho logic condition that may be found in or about the esophagus a

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no ed and removed early will have no complications The his
tory which was present in this case is often lacking because the

SPHENOPALATINE NEURALGIA

WALTER B. HOOVER

DR. GREENFIELD SLUDER first called attention to a set of neuralgic phenomena which he believed were produced by lesions affecting the nasal ganglion. The old terminology was Meckel's ganglion and the B. M. A. terminology is sphenopalatine ganglion. His paper was published in the New York Medical Journal May 23 1908, and as long as he practiced he carried out the most careful observation on this clinical condition. Dr Sluder has described the anatomy of the ganglion and its anatomical relation with their variations. He also described the history the diagnosis, the prognosis, the technic of treatment and the necessary instrumentarium. This can all be found in his book entitled Headaches and Eye Disorders of Nasal Origin.

It was my privilege to have had training under Dr Sluder and anyone who has been intimately associated with him could not fail to be impressed by his work and the result of his treatment. Since Sluder's writings some have scoffed at his work. Many have found some cases of this syndrome. Many have never looked for such cases and some have become fanatic on the subject of nasal ganglion neurosis and have reported relief of various symptoms especially pain in all parts of the body by treatment of the nasal ganglion. The following cases relieved by treatment directed to the nasal ganglion are presented for your consideration.

Case I.—Mrs E. L. age forty two years an unmarried school teacher complained of a dull pain throughout the left side of the face and especially behind the left ear and tenderness of the scalp, also tenderness above and below the left eye. This pain had been so fatiguing that she felt unable to carry on her work

complete and thorough examination including the use of the x ray, fluoroscope, special examination of the nose and throat and direct examination of the larynx and the esophagus are indicated before diagnosis of functional dysphagia is in order This diagnosis should only be made after all other conditions are eliminated If the dysphagia continues, reexamination should be made as a progress in the lesion will give new findings Functional dysphagia is less common than dysphagia due to organic lesions

I think it well to call your attention to the fact that difficult or painful swallowing can be caused by relatively mild chronic inflammation of the pharynx In the more acute and severe infections of the pharynx this is readily recognized by everyone Of the conditions external to the esophagus and cause dysphagia by pressure on the esophagus the larger percentage are due to malignant changes in the mass which gives the esophageal pressure and the possibility of malignancy must be kept in mind in all such cases Also I would emphasize that the results of treatment in cases complaining of dysphagia are usually satisfactory when due to cause other than malignancy with the result that people who have suffered for years may obtain the most marked relief in a very short period of time In those cases due to malignancy a prognosis of value is available and even some of these will get considerable relief through palliative treatment

cons derable mucoid secretion was present which contained a few pus cells. The sinuses were clear to x ray and to trans illumination. There was a mild chronic tonsillitis. The ganglion region was cocainized as in the previous case. The drawn ex pression of the face disappeared and the pain and the sensation in the face was relieved and it did not return for four days. Treatment of the ganglion region following cocainization of the ganglion with silver nitrate a phenol and iodine solution and neosilvol has relieved the condition for as long as two weeks at a time and as long as the attacks are less severe and are far less frequent he has preferred to continue treatment rather than have an injection of the ganglion which I have advised.

Case III—Mr E S age fifty years married salesman. Gave a history of pain in the left side of the face which came on at intervals sometimes several times daily and at other times as far apart as two weeks. This pain centers about the left side and is so severe that he has to stop wherever he may be and this pain may last for a few minutes to several hours. During the attacks there is lacrimation from the left eye a watery discharge from the left nostril which becomes obstructed. He noticed that the pupil of the left eye is smaller than the pupil of the right eye and is still smaller during an attack than it is when he is not having the pain. He has had treatment from many physicians including neurologists of international reputation. He is only partially relieved by sedatives even including large doses of morphia. Examination shows the left eye slightly less prominent than the right. The left pupil is smaller than the right but reacts to light and to accommodation. The consensual reflex is present. The external ocular movements were normal. Examination of the nose showed a chronic rhinitis with mucoid secretion and a deviation of the septum to the left. The sinuses were clear both to x ray and transillumination. The tonsils were small. Co cainization of the ganglion stopped the attack in a very few minutes. This was repeated on four separate occasions and an alcohol phenol injection of the ganglion was recommended and carried out using a straight Sluder needle and following his

and had to rest long hours in bed She was unable to attend social functions for this reason General physical examination by the medical consultant showed no abnormality Examination of the ears nose and throat was as follows the ears were normal Nose deviation of the septum to the left a mild chronic rhinitis some mucous no pus sinuses clear to transillumination The tonsils had been removed and the larynx was normal A drop of saturated solution of cocaine was applied to the ganglion on a cotton tipped applicator just above and below the posterior tip of the middle turbinate on the left side remaining in each position for five minutes The position of the applicator was checked by posterior rhinoscopy to make certain the applicator was in the correct position The pain near the ear and the tenderness of the cheek and scalp improved immediately and 2 per cent silver nitrate was applied to the ganglion area The treatment was repeated at a three day and a ten-day interval and she stated that she had marked improvement from the pain about the ear and the tenderness of her face was now more of a numb feeling The time between treatments was increased two weeks and then for a month She is practically free from ear pain from the tenderness of the scalp and face she is no longer fatigued and carries on social functions She reports for treatment only when she has any symptoms of the condition

Case II Mr M R age fifty four years married executive Gives a history that for eleven years he has had pain in the left ear and a drawing cramped sensation of the left side of the face This condition was made worse by a mental strain also when this sensation is present the lines of the face and the furrows of the forehead are much more prominent than at other times He has consulted physicians many times for this condition during the past eleven years without relief He was examined by me during the time that he had the sensation of the face and the pain about the ear and then it was noticed that the lines of the face were more prominent on the left than on the right side The eyes and the ears were normal The nose showed a chronic rhinitis with some hyperplasia of the mucous membrane and

KIDNEY INFECTIONS WITHOUT LOCALIZING SYMPTOMS

JAMES B. HICKS

It is a relatively common experience to have a patient with an obviously serious debilitating illness which seems to defy a satisfactory explanation. These blind cases offer problems which all clinicians recognize must be accepted and brought to a final solution. In such cases it is necessary to approach the study with an open mind and to follow each possible source of investigation until convinced that the symptoms are not related to that source. Thus clinical and x ray examinations of the heart lungs stomach gallbladder and intestines must be undertaken as a routine. Likewise repeated blood and bacteriological examinations will be done. Too often we believe the genito-urinary tract is overlooked as a source of serious trouble in the unusual and undiagnosed case. Too often the fact that the urine is normal or nearly normal is considered as adequate proof that kidneys ureters and bladder are free of disease. Too often the absence of frequent painful or difficult urination is considered as final evidence that the urinary tract is normal. This is a readily understood phenomenon since physicians are loath to urge the unpleasant and somewhat painful procedure of cystoscopy without adequate reason. x Ray examinations of the gastro-intestinal tract are not trying but pyelograms are considered in a much different spirit.

The 3 cases which we wish to report herewith show the necessity of performing a routine examination of the urinary tract as a definite part of the general program in cases undiagnosed by the ordinary relatively simple measures. During the last three years in the clinic there have been 3 cases of infected hydronephrotic kidneys which undoubtedly were the cause of serious

technic Following the injection there was considerable head
ache and slight swelling of the left cheek In two weeks, he
reported that his head felt "100 per cent' He had no further
attacks of the pain for eleven months when it returned as severe
as previously The pain was again controlled with cocainiza
tion of the ganglion and another alcohol phenol injection was
made but following this the attacks were worse for the following
twelve days then became markedly improved As it is believed
that the second injection was not effective because it was not
accurately placed, a further injection was advised but as yet the
patient has not felt the need of further injections

Comment —I wish to express my belief that there is a train
of symptoms which may be controlled by treatment directed at
the sphenopalatine ganglion and that these cases will be recog
nized if they are looked for and if the test of cocainization of the
ganglion is carefully carried out

Careful abdominal examination showed no tumor and no masses There was no tenderness over the kidney There was no change in urinary function Although we had no evidence pointing to the kidney as a source of infection, we nevertheless felt that the urinary tract was the only system in the body in
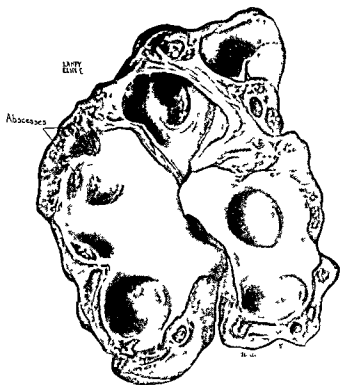
Fig 235 —Drawing of the gross appearance of the specimen from Case I

which we lacked positive diagnostic data For that reason, and no other, it seemed necessary to do a cystoscopic examination before we left the case as one of fever of unknown origin

The cystoscopic examination revealed a normally appearing bladder and a normally functioning right kidney The left

illness, yet presented no evidence on either history or clinical examination of their presence In each case the fact that the symptoms were due to infection in the urinary tract was found only by cystoscopic and pyelographic examination In each case this examination was carried out only because routine examination of the patient including gastro-intestinal x rays blood and bacteriological studies with careful physical examination failed to account for the symptoms which the patient presented

Case I —Mr F J age twenty four years was always of the under nourished type He felt as well as usual until three and a half months before his examination at the clinic The illness for which he came for examination had its onset with a feeling of general malaise and headaches lasting three days These symptoms were followed by chilly sensations and fever A few days later there was an attack of diarrhea during which a small number of red and white blood cells were found in the urine All during the illness the patient had been confined to a hospital in another city In an attempt to find the source of his fever repeated physical examinations blood studies and x ray examinations had been done with negative results except one Widal test which was reported as doubtfully positive His temperature had remained constantly elevated ranging from 99 to 100 F The pulse rate varied from 80 to 88 The white blood cell count was found to be constantly between 7000 and 8000 per cubic millimeter of blood

On admission to the clinic his general physical examination was essentially negative except for an elevation of temperature marked undernutrition and a secondary anemia The urine was negative except for a faint trace of albumin In view of the fact that the physical examination was negative and that repeated x rays of the heart lungs and gastro-intestinal system had been done elsewhere and were said to be normal we were confronted with the problem of diagnosis in a young man obviously sick with a fever of three months duration for which no adequate cause could be found Repeated Widal tests were negative

a sebaceous cyst of the vaginal wall was excised and the cervix cauterized The general physical examination showed marked weight loss anemia and slight fever The gastro intestinal studies the blood studies and orthopedic examination were essentially negative There was a rare white blood cell found in

Fig 236—Pyelogram of the left kidney in Case II Note the almost complete circular kink in the ureter just below the ureteropelvic juncture also the dilated and blunted calices

the centrifuged bladder urine A plain x ray of the urinary tract revealed nothing unusual After the patient had been under observation for some time a cystoscopy with pyelograms revealed a slightly hydronephrotic left kidney with an angulated ureter (Fig 236) The opposite kidney was normal It was felt

kidney was functionless Pyelograms of this showed a hydronephrosis with obstruction at the ureteropelvic juncture At operation a hydronephrotic kidney with innumerable pinhead sized abscesses in the cortex was removed (Fig 235) The obstruction was found to have been caused by an anomalous vessel to the lower pole Convalescence following the nephrectomy was entirely uneventful His temperature returned to and remained at a normal level on the fourth postoperative day His general health promptly became good A pyelogram of the remaining kidney done a few months later was essentially normal

Comment—The only symptom this patient had suggestive of urinary tract disorder was the presence of a few red and white blood cells in urinary sediment early in the course of his illness All the systems of the body had been studied by special examination except the urinary tract He had been suspected of having typhoid fever, undulating fever, and bacterial endocarditis with essentially negative laboratory tests for them all On admission to the clinic service the urine examination showed nothing abnormal except a trace of albumin and a check of the history did not give a lead as to the true nature of the trouble Cystoscopic and pyelographical study was done for completeness

Case II—Mrs D G, age thirty nine years was always in fairly good general health She had an appendectomy and a uterine suspension twenty three and twenty two years previously respectively During the twenty one years of her married life there were five pregnancies, four of which terminated in full term deliveries and one with a miscarriage The illness for which she came to the clinic had its onset seven months before, with a severe steady pain in the left lower abdomen Shortly after the onset the pain had diminished in its severity but was more or less constantly present up to the time of her examination Associated with the pain she had had constipation with mucus in the stools There was slight irregular fever, progressive weakness and a loss of 40 pounds in weight A few days after her present illness had begun an exploratory laparotomy was done elsewhere and nothing unusual was found Later

lower midabdomen and a palpable right kidney the physical examination was essentially negative

Examination of the urine showed a slight trace of albumin and a rare white blood cell with no sugar no albumin and no casts The blood nonprotein nitrogen white and red blood cell counts and the hemoglobin were within normal limits A functional disturbance of the large bowel was the only abnormality revealed

Fig 237—Pyelogram of the right kidney in Case III Shows irregular collections of the opaque solution in a low lying somewhat enlarged kidney

by a gastro-enterological study and the patient was sent to the hospital for further observation and medical management of the trouble During some two weeks of her hospital stay her symptoms persisted and a constant slight temperature was present No adequate explanation of this could be found Repeated Widals blood counts and physical examination revealed no explanation for her symptoms Finally cystoscopy and pyelogram were decided necessary because again the urinary

that the fever, anemia, and weight loss were due to a silent infection of this kidney and exploration was advised

At operation the kidney was found firmly bound with dense adhesions consistent with an extensive perinephritic cellulitis There were also numerous small abscesses in the kidney cortex but no free pus encountered   A subcapsular nephrectomy was done as it was impossible to free the surrounding adhesions to do any other type of operative procedure   Following the removal of the kidney the oozing in the surrounding tissues persisted On the evening of operation the patient was in moderate shock and there was still active bleeding from the incision 500 cc of citrated blood was given   Following this the convalescence except for gross wound infection was uneventful   Her general condition improved rapidly and the incision cleared satisfactorily under poulticing and Dakin s solution irrigations   She was discharged from the hospital greatly improved and mail reports indicate that she has returned to good health

Comment —This patient in addition to fever weight loss weakness and anemia had a vague abdominal pain with a bowel disturbance which in the absence of urinary symptoms misdirected the efforts of diagnosis   As in the previous case cysto scopic study solved the problem   It is also worthy of note there was an extensive perinephritic inflammation in this case with only a moderate grade of hydronephrosis

Case III —Miss G W , age forty four years was first seen August 24 1931 with a complaint of pain in the abdomen to the right of the umbilicus   The pain had begun suddenly two weeks before with a menstrual period during which the flow had been profuse whereas previously it had always been normal   For two days after the onset the pain was severe and steady and after that there was only an occasional slight twinge of pain   Asso ciated with the pain there were anorexia constipation and a loss of 6 pounds in weight   The past health had been generally good with no illnesses of consequence   Physical examination revealed a well-developed markedly undernourished woman of forty four   Except for some tenderness to palpation over the

lower midabdomen and a palpable right kidney the physical examination was essentially negative

Examination of the urine showed a slight trace of albumin and a rare white blood cell with no sugar no albumin and no casts The blood nonprotein nitrogen white and red blood cell counts and the hemoglobin were within normal limits A functional disturbance of the large bowel was the only abnormality revealed

Fig 237 —Pyelogram of the right kidney in Case III Shows irregular collections of the opaque solution in a low lying somewhat enlarged kidney

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tract had not been proved normal by positive laboratory data
By cystoscopy and pyelogram a functionless infected hydro-
nephrosis in the right kidney was discovered The left kidney
was normal in every respect Nephrectomy was therefore
advised and undertaken (Fig 237) At operation an infected
hydronephrotic right kidney with numerous cortical abscesses
was removed The postoperative convalescence was uneventful
and the patient rapidly returned to good health

   Comment —This patient s symptoms suggested a disorder of
the pelvic organs or appendix When the findings from the other
examinations were insufficient to explain her symptoms a cysto-
scopic examination was done which solved the problem

SUMMARY

   Infected hydronephroses and perirenal inflammations are
probably the only types of renal lesions that give rise to general
systemic symptoms without localizing signs Probably more
often than is suspected these lesions give rise to temperatures
that cannot be explained by a thorough study of the other
symptoms Cystoscopic study must be done routinely in this
type of case before allowing the patients to proceed too far with
out a satisfactory explanation of the symptoms since this alone
will give positive evidence of the presence or absence of a normal
urinary tract

RESECTION OF THE UPPER DIVISION OF SUPERNUMERARY FUSED KIDNEY

James B. Hicks

Partial resections of the kidney are infrequently indicated although occasional reports of this operation are found in the literature. It may be indicated in those patients with renal duplication in which the pathology is chiefly or entirely localized to one division of the kidney, in patients with localized hydronephrosis or pyonephrosis of a normally formed kidney and in certain patients with solitary cysts and benign tumors.

The supernumerary fused kidney with partial or complete duplication of the ureter is of fairly common occurrence. Practically always there is some disease process associated with this anomaly. The most common disorders encountered are hydronephrosis, pyelonephritis and calculi. Inasmuch as these pathologic processes probably arise in these cases due to poor drainage difficulty is experienced in treating them conservatively because they cannot be successfully handled by cystoscopic methods as in the normally formed kidneys. Consequently if the symptoms are severe enough to warrant operation any procedure that fails to provide adequate drainage will be unsuccessful. The operation that approaches the ideal is hemi nephrectomy and ureterectomy when the lesion is not enough advanced to warrant complete nephrectomy.

In the case to be reported there was only a moderate degree of hydro-ureter and hydronephrosis and no infection but the symptoms were very marked and caused the patient considerable disability. She was insistent that something be done to relieve her. As she was a young woman who had already had two previous major operations consequently conservatism in treating her was very desirable.

When planning the operation we hoped that by resecting the

ureter to the upper and smaller division and ligating the stump
that this division of the kidney would undergo atrophy as is the
case in an uninfected single kidney This was also a compara
tively simple and safe procedure This operation proved to be
of no benefit because an additional operation was necessary to
cure the patient and the disability was greater than at any time
previously

Fig 238 A pyelo uretero gram obtained by inject ng through a small
catheter n the lower u e er shows moderate d latat on of both d s ons of
the ureter The junct on of the two s just abo e the bladder le el

Case Report—Mrs E L age thirty years always had fairly
good general health For several years she had had recurrent
attacks of right sided abdominal pain typical of renal colic In
addition there was marked frequency of urination both day and
night She was the mother of 2 children Five years previous
to examination a right ovarian cyst a left paraovarian cyst and
the appendix were removed at one operation A few months
later she had a subtotal thyroidectomy for a toxic goiter For

nine months previous to the urological examination she had been treated for a functional disturbance of the large bowel without appreciable benefit

The general physical examination revealed essentially normal findings except for a palpable right kidney   The urine blood and stomach analysis showed normal results   The blood Wassermann was negative and there was no pus blood or casts in

Fig 239—A pyelogram done six weeks after the last operation shows a decrease in the size of the ureter and lower pelvis   The kidney is in excellent position where it was fixed at the time of operation

the catheterized urine sediment   A cystoscopic study revealed a bladder with good tone and capacity and no evidence of inflammation   The kidneys functioned well   The plain x ray showed the left kidney to be regular in outline of the average size and in good position with a normal type of pelvis calices and ureter   The right kidney was longer than usual but regular in outline and in good position   The pyelogram however showed a duplicated pelvis and ureter on the right   The two divisions

of the ureter joined just above the bladder level (Fig 238)
There were no shadows suggestive of calculi

Following the cystoscopy this patient was observed for
three and a half months during which time she had repeated
attacks of right-sided abdominal pain typical of renal colic.
She insisted that something be done to relieve her, even though
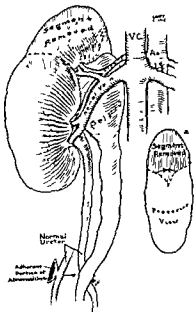
Fig 240 —This drawing of the findings at the second operation shows (1)
the marked hydro-ureter and hydronephrosis of the upper division of the du
plication (2) The separate blood supplies are also illustrated (3) The insert
shows the segment of kidney to be removed which is self-explanatory (4)
and a small segment of the upper ureter which was adherent to the lower
segment because of which it was left in place

it be a nephrectomy It was finally decided to resect the upper
division of the duplicated ureter, tying the stump proximal to
the kidney in the hope that this portion of the kidney would
undergo atrophy This was undertaken because it was believed
that the obstruction was due chiefly to the ureters crossing each
other before joining This was carried out and she felt improved

for a short while but then a different type of dull steady aching pain returned and the kidney was definitely larger by palpation Eight months later at a second operation the remaining portion of the ureter and the upper division of the kidney were resected (Figs 240 241) Convalescence was uncomplicated and although it is only three months since operation the patient is greatly improved
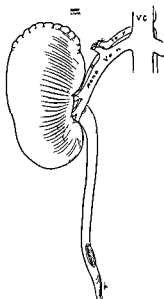
Fig 241—This drawing illustrates the appearance of the segment of the kidney left in place at the completion of the operation

Comment—By a comparison of the pyelo ureterograms pre and postoperatively in this case a definite decrease in the caliber of the ureter meaning is noted The patient is also clinically better and is grateful for the result Resection proved to be a fairly simple procedure in the presence of the hydronephrosis and also in the presence of a separate blood supply for each division of the kidney Probably if the operation should be undertaken again it would be much more satisfactory to do the resection of the kidney and ureter at the primary operation

URINARY INCONTINENCE IN WOMEN—A CASE REPORT

Howard M Clute

Incontinence in women following childbirth and occurring during the day time hours when they are on their feet carrying out their usual routine is not uncommon and although it is a difficulty rarely causing serious disability or illness it is nevertheless so embarrassing and disturbing that many women are greatly incapacitated by its presence Numerous surgical procedures have been advocated for its repair and with each type of operation beneficial results have occasionally been obtained H W Johnston of Toronto has carefully studied incontinence in women following childbirth and has reported this experience [*] From his dissections he believes that urinary incontinence is due to a loss of function of the sphincter urethral muscle which lies between the layers of the triangular ligaments and is a muscle of very definite size—the voluntary muscle of micturition in the female Johnston finds by dissection of subjects who were known to have had incontinence of urine following childbirth that this voluntary urethral sphincter and the layers of the triangular ligaments are torn From the anatomy which he presents and from the results of his operation in such cases he believes that the majority of patients with incontinence following childbirth can be cured by the suture of this external sphincter of the urethra and in supporting the surrounding structures

The following case report is the record of the first patient on whom we have operated by this method and we present it because it seems to us that Dr Johnston s description of the anatomical findings in this condition and his recommendation

for the cure of the condition, based on these findings are so satisfactory that the method should be given wider notice

Case Report—Married woman age fifty-seven years This patient came to the clinic because of digestive disturbances which had been present for some time In the course of her history and examination it was noted that she had incontinence of urine whenever she was on her feet She stated that this had followed immediately after the birth of her son twenty-one years ago and during this interval had persisted with relatively little variation The incontinence is almost entirely diurnal and was so severe that it very nearly prohibited her going about in society Walking about coughing sneezing laughing, straining—all resulted in an immediate emptying of the bladder of whatever urine was present in it During the night while lying asleep no urinary leakage ever occurred When rising from bed in the morning however the incontinence was so pronounced that usually the patient was unable to get from her bed to the bathroom without soiling herself and the floor When occasions arose which made it necessary for her to go to some social gathering she commonly wore ten to twelve thicknesses of cloth yet this would usually be insufficient to protect her

The general physical examination and the remainder of her history were not remarkable in reference to this disturbance Careful cystoscopical examination of the urinary tract was carried out—the right kidney and ureter were normal and the bladder was normal A small ureterocele on the left side was found with some dilatation of the pelvis of the left kidney and the ureter above it No cystoscopical evidence could be seen to account for the incontinence Her central nervous system was normal

On July 21 1931 the ureterocele was removed by fulguration of the left ureteral orifice and dilatation of the ureter Operative repair of the ruptured urethral sphincter muscle was then undertaken after the method recommended by Johnston The cervix was caught with a tenaculum to hold it steadily in place A vertical incision was made in the mucosa of the anterior vaginal wall in the midline starting immediately behind the

external urethral orifice and going back toward the cervix for 2 to 3 inches The anterior vaginal wall was elevated and dissected laterally for a considerable distance on each side Considerable annoying bleeding may occur as this dissection is carried laterally and posteriorly due to the erectile tissue present in these areas The urethra and the neck of the bladder were now exposed in the wound A mushroom self retaining catheter was passed into the bladder and with gentle traction upon this the area of the trigone with the neck of the bladder was brought into view Careful dissection in the area of the triangular ligament discloses the ruptured end of the external urethral sphincter muscles In the patients in whom we have done this procedure we have been surprised to find how far laterally toward the pubic ramus it was necessary to go to pick up the torn ends of the muscles They are quite substantial structures when found however and can be brought out quite readily and returned to their normal position posterior to the urethra

It is of course a common experience in a third degree repair of the perineum to find each end of the external sphincter muscle of the anus still present and visible many years after the rupture of the muscle occurred—so it is not unreasonable to report that the divided external sphincter muscle of the urethra can also be found intact and able to carry on its work many years after rupture has occurred

Once the cut end or ruptured end of the external muscles are found they are caught with appropriate clamps and held while mattress sutures are placed which bring them together again closely behind the urethra thus completing once again the sphincteric action of this muscle

The operation is completed after the careful repair of the sphincter muscle is finished by the usual repair of the cystocele The mushroom catheter which was put into the bladder for traction to demonstrate the neck of the bladder and the external sphincter muscle is left in place for six to ten days to permit satisfactory healing of the sphincter muscle before any marked strain is put upon it It should we believe be removed with great care in order that its bulbous end will not bulge the sphinc

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the change in her condition and the relief received after twenty-one years of incontinence

This case is reported here because it seems of value to call still further attention of the profession to this logical and simple procedure which Dr Johnston has devised for the treatment of a condition which is frequent among child bearing women and when present is most annoying and embarrassing

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ter muscle at the point of suture and tear out the softening
stitches

After the catheter has been removed it has been our custom to
catheterize the patient once in six or eight hours and if there
is a residual of 2 ounces or more of urine to wash the bladder
out with normal salt solution and repeat the catheterization every
six or eight hours Within twenty four to forty eight hours we
have found the residual dropping to an ounce or less and no
further catheterization necessary

Starting two to three weeks after the sphincter has been
sutured we have requested the patient to practice with the use
of the voluntary external sphincter muscle each time she passes
urine This we have done in similar circumstances with male
patients who have had slight incontinence of urine after their
prostate was removed and in these cases we have felt that the
muscle tone was definitely improved by the exercise When
the patient s bladder is full she passes a small amount of water
and then quickly attempts to shut it off by contracting the ex
ternal sphincter This procedure she repeats until the bladder
is entirely empty of urine In this particular case we felt this
maneuver was of definite assistance and that as she went on with
it continence became more definitely complete

The course which this patient has had since this small opera
tion was performed has been illustrative of the above statement
For the first four weeks following her operation she persisted in
having some slight incontinence although she felt she was very
markedly improved at once after the catheter had been re
moved As she went on however with exercises of the external
sphincter muscle her incontinence became less and less pro
nounced until at the close of a month she had practically no
difficulty whatsoever It is now approximately six months
since the operation and she is almost completely continent It
is no longer necessary for her to wear any pad She goes to
the theater and to various social functions with ease and comfort
She occasionally loses a tiny bit of urine when she laughs un
usually hard or strains at lifting She is quite delighted with

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DRAINAGE IN BREAST AMPUTATION WOUNDS

Richard H. Overholt

At the time of closure of surgical wounds, drains are inserted whenever there is a possibility of an accumulation of serum, secretion, blood or purulent material. In order to carry out a satisfactory radical breast operation there are necessarily pro

Fig. 242 — Drawing of a breast amputation wound showing most frequent site of a serum collection and inadequacy of stab drainage in posterior axillary area.

duced large extensively undermined skin flaps. Potential spaces are created in the axilla and under the clavicle. Pectoral muscle stumps are left at the point of their insertion. Shifting of wound surfaces is more likely because of arm and shoulder motion. It

has become the practice of most surgeons to drain the axillary space by making a stab wound in the posterior axillary line in order to permit the exit of the drain in the most dependent portion of this area (Fig 242)

It has been our experience, however, that should serum accumulate in a breast wound the collection points upward and makes an appearance beneath the incision near its upper end or takes place under the upper flap just below the clavicle A drain in the posterior axillary line has been of little value in the pre-

Fig 243   Drawing of a breast amputation wound showing location of drain which best provides for drainage of serum

vention or in providing a satisfactory exit for the fluid Frequently probing the upper regions of the wound through the primary incision was necessary infection occasionally followed and often patients were discharged with all of the wound healed except a small discharging sinus in the upper portion of the wound

It is now our practice to place a drain in the axilla and carry it out above providing a point of exit at the most likely place for the collection of serum The posterior axillary stab drain is

omitted (Fig 243) Axillary accumulations have not been en
countered, subsequent probing has been less frequently necessary
and the time required for complete healing has been shortened
The discomfort to the patient of an added incision and drain
near the back is avoided

A METHOD OF SECURING GAUZE DRESSINGS ON DRAINING WOUNDS

Richard H. Overholt

Any satisfactory method of securing gauze dressings or pads on a draining wound must comply with the following requirements First, the gauze dressings should be held securely in place over a period of several hours, second the dressing itself must be comfortable to the patient and the restriction of body movement minimized, especially is this true of respiratory movement when the dressings are on the thorax or on an upper abdominal wound, third, ease with which dressings can be changed, and fourth economy of material

The use of plain adhesive strips over gauze on draining wounds is wasteful and inconvenient There is a necessity of applying new strips with each change of gauze and a certain amount of discomfort to the patient in having the adhesive removed at frequent intervals The usual method of applying gauze beneath folded adhesive tape strips and tying the ends together with inelastic tape is not always satisfactory As a rule after the dressings have been changed a few times, the drawing up on the tape as it is tied pulls the adhesive strips together and the dressings soon become loose and disorganized New adhesive strips are required frequently These adhesive strips are either too tight or too loose and a neat appearing dressing is maintained with difficulty

We have found that the use of rubber bands put over applicator sticks between folded adhesive tape serve as a very efficient method of holding dressings in place These elastic bands give a constant, even pull on the adhesive strap, accommodate themselves to changes in body contour and movement and are comfortable to the patient They keep dressings in place over a

long period of time A change in the gauze can be quickly made
without the use of new adhesive straps Such a type of dressing
is particularly useful in chest cases where patients have draining
wounds over long periods of time and are frequently treated as
ambulatory patients The adhesive straps are made in the
following way A strip of adhesive tape, the size depending upon
the size of the gauze covering the wound is stretched out on a
table with the gummed surface up Three fragments of an
applicator stick are used, two are cut so that they are as long as
the adhesive strip is wide, and the third is cut ½ inch longer
The longest stick is placed across the adhesive strip 1½ to 2
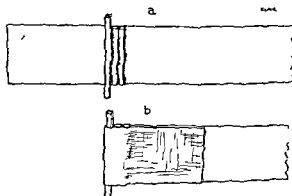
Fig 244—a Drawing to show how a strip of adhesive tape is folded over
applicator sticks b folded strip ready to be applied to wound area

inches from one end Each end of the stick extends about ¼
inch beyond the edges of the adhesive strip The other two
sticks are placed parallel and next to the first so that their ends
are even with the edge of the adhesive strip (Fig 244) The
short end of the adhesive strip is then folded over these appli
cator sticks The first stick holds the rubber band while the
second and third keep the end of the straps flat when the rubber
band is in place and prevent the strip from folding or doubling
up Two of such straps are placed on each side of the dressing
opposite each other and ordinary rubber bands are placed
between (Fig 245) The adhesive straps are so placed that only

the adhesive part is on the skin and the folded end extends over
the gauze dressing The free ends of the strap should be 4 or 5
inches apart over the dressing for most wounds As a rule the
proper tension on the strap is obtained when the rubber band
itself is stretched out to about twice its normal length so that if
a 2½ inch rubber band is used the free ends of the adhesive straps
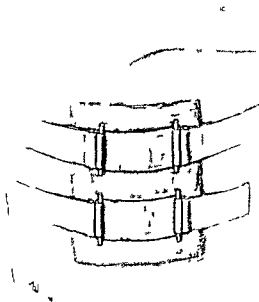
Fig 245—Drawing to illustrate method of applying adhesive straps and
rubber bands to secure a dressing on a draining wound

should be 5 inches apart Too much tension will tend to draw
the adhesive straps together as so often happens when an in
elastic tape or gauze bandage is used to tie the three ends of the
adhesive straps together It is important that none of the
adhesive portion of the strap come in contact with the gauze of
the dressing as a change of the gauze will then not dislodge the
straps which should be more or less permanent If care is used

in making the strap and if they are correctly placed on the wound, they will remain in position for a week or more and thus create a great saving in the cost of material for the care of draining wounds

TREATMENT OF SEVERE CONTRACTURE OF CALF MUSCLES

G E HAGGART

PRONOUNCED contracture of the calf muscles may be a progressive deformity, the result of lower leg muscle imbalance as for example in residual poliomyelitis, where weakness or paralysis of the flexor muscle group of the lower leg permits overaction of the foot extensors, i e, the calf muscles A similar mechan

Fig 246

Fig 247

Figs 246 247—Photographs illustrating severe calf muscle contracture on patient reported—when first seen

ism is seen in patients who because of long illness lie in bed with the feet continuously in an equinus or dropped foot position In the treatment of lower extremity fractures, by suspension and traction in a Thomas splint, calf muscle contracture is particularly apt to occur unless care is taken to support the foot at a right angle with the leg

The significance and frequency of this contracture in foot strain has already been discussed in these clinics (April 1931)

This patient—a well developed and healthy appearing boy of eight years—had been treated elsewhere for a fracture of the right femur three months before entering the clinic When first seen he complained of pain in the right calf and difficulty in walking associated with frequent falls On examination (Figs 246 248) the boy is seen to stand and walk with the right leg

Fig 248—Illustrating maximum foot dorsi flexion with hip and knee flexed

held in front of the body the foot inverted with the point of weight bearing over the metatarsophalangeal joint region the skin of which area was covered with a thick callus The foot was held in 130 degrees plantar flexion (140 degrees is the normal extreme range of this motion) because of marked contracture of the calf muscles A pressure ulcer was seen over the posterior aspect of the tendo achillis

TREATMENT

A severe contracture of the calf as illustrated is very disabling and demands immediate care One has the choice of several methods An efficient and frequently the simplest therapy is operative lengthening of the tendo achillis This is

best carried out by either the Hibbs (Fig 249) method or a
Z shaped (Fig 250) tenotomy   In the former procedure the
continuity of the tendon is not interrupted   In making the
Z shaped incision in the tendon the latter is actually divided into
two overlapping tongues which are then sutured with silk   In
either operation great care should be taken to preserve and
separately resuture the sheath of the tendon   Operation of this
type is especially indicated in children   Adults do not adjust
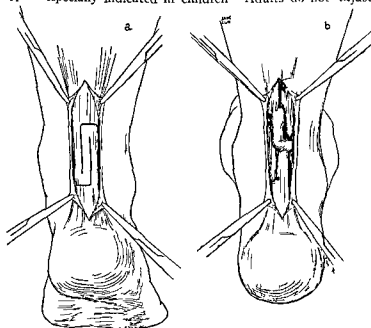
Fig 249   The H bbs techn c n tendon lengthen ng

themselves well to the relatively sudden increased tendon length
and in addition are loath to carry out the exacting after treat
ment of first plaster then ankle braces and particularly the
muscle exercises

In the patient reported operation was contraindicated be
cause of the pressure ulcer directly over the soft tissue covering
the tendon   Therefore other means had to be adopted as
described below

The plaster boot is of considerable assistance in resistant cases particularly adults where operation may be contraindicated and in cases where the patient can only be seen at intervals   This boot is fashioned by first incasing the lower leg and foot in plaster   No attempt is made to correct the deformity   The plaster about the tendon and heel is then cut away as illustrated (Fig 251 a) and a strong U shaped steel is covered with
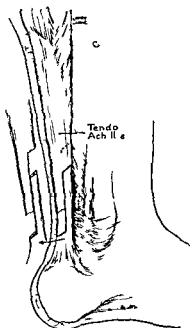
Fig 250   Z shaped tenotomy

plaster and applied to the leg as illustrated in line with the fibula and tibia while the base of the steel is slightly below the level of the forefoot (Fig 251 b)   The arms of the steel are incorporated in the leg plaster   the space intervening between the heel of the foot proper and the cross bar of the steel is filled with lambs wool and the whole covered with further plaster of paris   The patient is then instructed to walk   and on weight bearing the

heel progressively descends to a level with the forefoot so that a considerable stretching of the calf muscles ensues

If the patient may remain under observation one can more easily employ gentle manipulation and the so called wedging plaster By this method a stretching of the calf muscles is obtained by manually dorsiflexing the inverted foot It is very important to remember that such a manipulation will break down
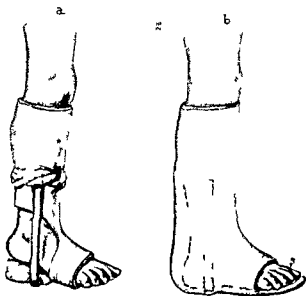
Fig 251—Tract on plaster boot to lengthen tendo achilles

the arches of the foot unless the latter are protected by a previously applied plaster shoe

In the patient here recorded the above procedure was carried out as follows

Under general anesthesia a plaster shoe was first put on the foot The leg from upper thigh to just above the ankle was next encased in plaster the latter being necessary to prevent

strain on the knee joint   Unless this joint was protected power
ful dorsiflexion of the foot would tend to force the knee into
recurvatum that is back knee   Gradual stretching of the
calf muscles was then carried out by progressively forcing the
foot toward a right angle with the leg   In this first stretching
approximately 20 degrees correction was obtained so that the
foot was then held in 110 degrees plantar flexion   This degree
of correction was maintained by covering the anterior med al
and lateral aspects of the ankle with a thick felt pad on top of
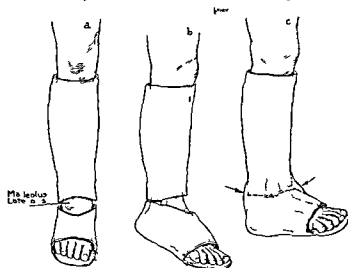
F g 252—Illustrat ng the wedg ng plaste as employed n case reported Fo
clar ty plaster is shown onl ex end ng to knee

the sheet wadding already applied and the shoe and the leg
plaster were then united by plaster applied over this felt around
the ankle-joint region

Ten days later a wedge of plaster (Fig 252 a b c) was re
moved over the anterior ankle joint region so that the felt pad
underlay the cut edge of the plaster Without anesthesia the
foot was still further dorsiflexed gaining another 20 degrees at
which point the leg and foot made a right angle This position
in turn was also maintained by plaster applied over the cut

out area   One week later the long leg plaster was removed and a plaster boot put on with the foot at 80 degrees flexion (Fig 253)
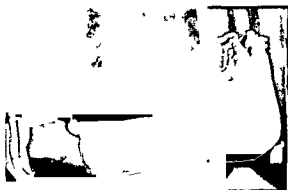
Fig 253—Low cut plaster boot for walking

The actual correction of the foot is greater than the right angle shown, because a thick plantar sole of plaster was added to per mit walking

Fig 254—End result of wedging plaster stretching of calf   Compare with Figs 246 247

Seven weeks following the initial manipulation plaster paris was discarded followed by an ankle brace of the usual type with catch to prevent foot drop   This brace the patient wore one

month since which time he has normal dorsiflexion of the foot
(Fig 254) Following the removal of the plaster the patient
many times daily carried out exercises to stretch the calf muscles

In the treatment of contracture of the calf muscle it must
always be borne in mind that the condition is usually quite
resistant to correction Even when 80 to 90 degrees dorsiflexion
of the foot has been obtained contracture of the calf will recur if
the patient is not kept under observation until adequate muscle
balance is reestablished between the flexors and the extensors of
the foot

FRACTURE OF THE PATELLA

G E HAGGART

FRACTURE of the patella is not uncommon There is complete disability With inadequate care a prolonged loss of function results The latter would appear unnecessary in view of the present methods of treatment Reported below is a typical case with a short review of the anatomy and an analysis of various types of therapy

ANATOMY (FIG 255)

Attached to the upper border of the patella is the quadriceps tendon Being a sesamoid bone the patella is surrounded
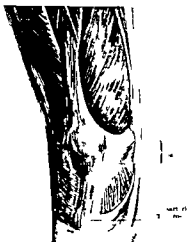
Fig 255—Anatomical view of anterior knee joint region from Spalteholtz

by this tendon and is furthermore covered anteriorly by fibers of the tendon of the rectus muscle From the lower border of

773

the bone extends the continuation of the above tendons called the patellar ligament, which in turn inserts into the tibial tubercle On either side, these structures are continuous with the dense fascia lata of the thigh In connection with patella surgery this fascial expansion over the front of the knee joint is termed the aponeurosis When the patella is fractured the aponeurosis is transversely torn to a greater or less degree and in addition tendinous strands are consistently found interposed between the bone surfaces These strands are the torn rectus tendon and must be removed before accurate approximation of the bone fragments can be made The under surface of the patella is cartilaginous and to the periphery the synovial membrane is attached

MECHANISM OF INJURY

The patella is commonly fractured by indirect violence—a sudden powerful contraction of the quadriceps muscle This results in a transverse fracture, accompanied by a similar tear through the aponeurosis on either side of the bone The tear in the aponeurosis may extend well down to the midline on the inner and outer side of the knee joint region As a rule the synovial membrane is also torn, and hence the knee joint region is open

ANOMALIES

Congenital anomalies of the patella must be kept in mind in apparent slight injuries to the knee They can usually be identified if looked for since anomalies are as a rule bilateral and if present are found in the upper quadrant of the patella—a rare site for fracture

CASE REPORT

The following case report presents a characteristic history and clinical findings The patient was a frail thin woman of fifty eight who thirty six hours before entrance to the hospital slipped and fell downstairs Trying to save herself she severely wrenched the right leg On arising and starting to walk the right leg gave way beneath the body weight and she fell again Since that time the patient has not been able to walk and has complained of pain and swelling in the right knee

Local examination revealed pronounced generalized swelling of the right knee joint region, with a large amount of free fluid in the joint. There was definite evidence of a fracture of the patella in its distal one third as shown by palpating the two fragments, which were separated some 4 to 5 cm. The x ray (Fig 256) illustrates the condition after a posterior splint had been applied, and also shows that the distal fragment was rotated anteriorly more than 90 degrees.

Fig 256—Lateral x ray knee showing fracture of patella with separation of fragments. The distal smaller fragment is comminuted and rotated 90 degrees anteriorly

On admission this patient presented evidence of a subsiding mild respiratory infection. She was, furthermore very frail. These two findings indicated delay in operation. Such a delay also permits the joints to react to the injury and thus prepare a line of defense against possible infection. A posterior plaster splint was therefore applied as described below to immobilize the knee joint and at the same time permit massage of the leg for maintenance of muscle tone.

TREATMENT

Operative repair is the method of choice in comminuted or complete fractures of the patella particularly where there is evidence of a slight tear in the aponeurosis Contraindications to operation are the patients presenting severe laceration and crushing of the soft tissue over the anterior knee joint region as well as those patients in whom for general systemic cause any operative therapy is ill advised

The treatment may be therefore most simply classified under (1) conservative and (2) operation

Until the relatively recent development of successful operative joint technic conservative or expectant treatment in these fractures was the rule Such treatment consisted in keeping the patient in bed applying an adequate posterior ham splint to the extremity—which is kept elevated to relax the quadriceps muscle and as the fluid in the knee joint subsides applying straps or tapes to hold the patellar bone fragments in apposition Massage to maintain muscle tone in the extremity is given once daily The ham splint is best made of plaster of paris To be effective it should extend from just below the gluteal fold to the tendo achillis The splint is bandaged to the leg—or as a minimum requires three bands to maintain stabilization i e a band at either extremity of the splint and a third applied just below the knee joint

Such conservative treatment necessitates the patient remaining in bed on the average of about six weeks without any motion in the knee joint He is thereafter allowed up wearing a removable plaster or brace and starts walking with crutches but does not then bend or flex the knee joint Knee joint motion is only permitted when not bearing weight

SUMMARY OF CONSERVATIVE TREATMENT

The patient is originally in bed a minimum of about a month without knee joint motion he then wears a supporting apparatus another three to five months in which period active joint function is permitted only when not bearing weight

It is obvious that were one treating an elderly patient in

which group patella fractures frequently occur, this long period of immobilization of the knee would greatly delay, if not preclude, normal return of knee joint function, because (1) pronounced arthritic change may develop in the joint (2) the reestablishment of normal relationship of the bone fragments is very uncertain, (3) because of irregular separation of the torn

Fig 257 — x Ray of an old ununited fracture of patella Note wide separation of fragments and widespread hypertrophic change Knee is weak

surface the aponeurosis will heal as a wide scar—thus weakening the quadriceps action Figure 257 shows the x ray of an old fracture of the patella which was apparently treated by simply keeping the patient in bed The wide separation of bone fragments is seen This patient can walk, but the knee joint is somewhat unstable, and there is definite weakness of the quad

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Operative repair is the method of choice in comminuted or complete fractures of the patella particularly where there is evidence of a slight tear in the aponeurosis Contraindications to operation are the patients presenting severe laceration and crushing of the soft tissue over the anterior knee joint region as well as those patients in whom for general systemic cause any operative therapy is ill advised

The treatment may be therefore most simply classified under (1) conservative and (2) operation

Until the relatively recent development of successful operative joint technic conservative or expectant treatment in these fractures was the rule Such treatment consisted in keeping the patient in bed applying an adequate posterior ham splint to the extremity—which is kept elevated to relax the quadriceps muscle and as the fluid in the knee joint subsides applying straps or tapes to hold the patellar bone fragments in apposition Massage to maintain muscle tone in the extremity is given once daily The ham splint is best made of plaster of paris To be effective it should extend from just below the gluteal fold to the tendo achillis The splint is bandaged to the leg—or as a minimum requires three bands to maintain stabilization i e a band at either extremity of the splint and a third applied just below the knee joint

Such conservative treatment necessitates the patient remaining in bed on the average of about six weeks without any motion in the knee joint He is thereafter allowed up wearing a removable plaster or brace and starts walking with crutches but does not then bend or flex the knee joint Knee joint motion is only permitted when not bearing weight

SUMMARY OF CONSERVATIVE TREATMENT

The patient is originally in bed a minimum of about a month without knee joint motion he then wears a supporting apparatus another three to five months in which period active joint function is permitted only when not bearing weight

It is obvious that were one treating an *elderly patient* in

Many surgeons have employed silver wire   In particular Hawley
reported good results with this method

Since the work of Gallie and Le Mesurier on fascia and tendon
transplantation, suture with these tissues has been employed in
an increasingly wide field   It is particularly indicated in repair
of the patella fractures   Allen has described a modification of
fascial suture of the patella which has the merits of simplicity,
effectiveness, and ease of performance   An important require
ment in this technic is to employ a drill of sufficient diameter
1/4 to 5/16 inch preferred, that the resulting hole in the bone is
large enough to permit easy passage of the rolled fascial strip
This procedure is described in the operative report below

DESCRIPTION OF OPERATION

Fracture exposed through a slightly curved incision, apex
downward

The aponeurosis was torn across the anterior aspect of the
joint and the tear extended posteriorly beyond the midline of
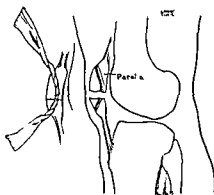

F g 2o8 —Illustrat ng method of drill ng fragments

the lateral and medial joint region   The patella was fractured
in its distal fifth with wide separation of the fragments   The
smaller fragment was comminuted and rotated over 90 degrees,
so that the fracture surface was directed anteriorly   A large

riceps muscle The patient's leg tires very easily The result is not satisfactory

OPERATIVE TREATMENT

In the majority of cases operation is the preferred form of treatment Its principal advantages are (1) relatively short convalescence, viz motion at knee joint, with the type of operation described below, can be started the day after operation Walking with crutches in a month is possible, with thereafter progressive weight bearing, until in ten to twelve weeks, if not before, all apparatus is discarded (2) Such results are obtained by apposition of bone fragments, and by accurate repair of the torn fascial expansion (3) Because of the almost immediate motion in the knee joint following operation arthritic changes in that joint, and limitation of function from prolonged immobilization, do not occur (4) The patient s economic burden is materially lessened

In deciding for or against operation, it must be borne in mind that conservative treatment *if properly carried out*, particularly emphasizing the necessity of daily massage will usually result in a functioning limb The drawback to operation is the danger of sepsis Should the latter occur the result is disastrous—a stiff knee being certain Thigh amputation and even death may follow

Open operation aims at accurate replacement of the bony fragments and suture of the torn lateral aponeurosis When the patella is comminuted accurate replacement of the fragments is often difficult because of their small size This was true in the case reported Anatomical repair of the aponeurosis is particularly important since upon the integrity of this fascia primarily depends the power of extending the lower leg on thigh

THE TYPE OF OPERATION

Blake emphasized the importance of repair of the aponeurosis (see above) when he advocated suture only of this torn fascia Bone fragments were approximated by special stay sutures introduced on either side of the patella In my hands this procedure has not prevented separation of the bone fragments

Many surgeons have employed silver wire. In particular Hawley reported good results with this method.

Since the work of Gallie and Le Mesurier on fascia and tendon transplantation, suture with these tissues has been employed in an increasingly wide field. It is particularly indicated in repair of the patella fractures. Allen has described a modification of fascial suture of the patella which has the merits of simplicity, effectiveness, and ease of performance. An important requirement in this technic is to employ a drill of sufficient diameter 1/4 to 5/16 inch preferred, that the resulting hole in the bone is large enough to permit easy passage of the rolled fascial strip. This procedure is described in the operative report below.

DESCRIPTION OF OPERATION

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The aponeurosis was torn across the anterior aspect of the joint, and the tear extended posteriorly beyond the midline of

Fig 258.—Illustrating method of drilling fragments

the lateral and medial joint region. The patella was fractured in its distal fifth with wide separation of the fragments. The smaller fragment was comminuted and rotated over 90 degrees, so that the fracture surface was directed anteriorly. A large
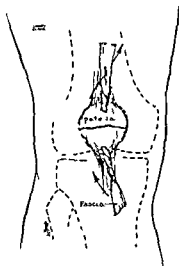
Fig 259—Passing fascial strip through drill hole in bone fragments—
arrows indicate manner fascia is fenestrated and distal strip drawn through
proximal strip
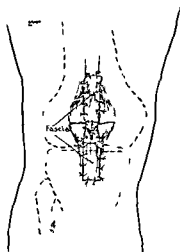
Fig 260—Suture of fascial strip

amount of thick viscid bloody joint fluid escaped from the wound

The method of drilling the fragment is shown in Fig 258 Note that the operator is careful to avoid perforating into the joint surface of the patella A rolled strip of fascia from the opposite thigh measuring 2½ by 10 inches was then drawn through the drill holes as shown in Fig 259, the lower end of the strip passed through the opening in the upper part and the
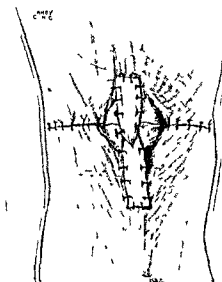
Fig 261 —Suture of patella and of aponeurosis completed

respective ends sutured as shown in Fig 260 to the quadriceps tendon above and to the patella ligament below   The torn aponeurosis was sutured with interrupted chromic gut (Fig 261) No cast or splint was applied

POSTOPERATIVE COURSE

Figure 262 shows the postoperative x ray   Active motion with passive assistance was begun the day after operation

Fig 262 —Lateral x ray of knee showing operative repair in fracture of patella
with comminution distal fragment

| Fig 263 | Fig 264 |

Figs 263 266 —Photographs illustrating end result in operative repair of
fractured patella
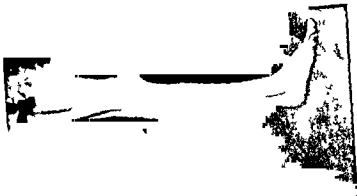
Fig 265

Fig 266

Massage to the leg was given daily This patient had flexion to a right angle from full extension one month after operation at which time she began walking with crutches Six weeks after

operation there was normal range of motion in the knee joint, and the patient walked with a cane in the eighth week Patient discarded all supports the twelfth week after operation

Figures 263-266 show the end result, exhibiting normal joint motion and equal development of leg musculature

CHRONIC ARTHRITIS   METHODS IN DIAGNOSIS AND TREATMENT

G E HAGGART

THE American Commission for the Control of Rheumatism has placed before both professional and lay public the complex nature of chronic arthritis emphasizing that It is a generalized disease with joint manifestations The widespread prevalence of arthritis is stressed and the consequent economic loss emphasized

It is to be hoped that in the near future there will be institutions especially equipped to care for these distressing cases but until that time the general practitioner is called upon to do what he can for relief of these patients Many physicians when confronted with a case of chronic arthritis tend to regard the outcome as relatively hopeless In the main this uninspired attitude results in part from lack of knowledge on how to proceed and secondly from a feeling that regardless of what is done the eventual outcome will be the same Such pessimism is not warranted In early cases particularly the time when the family physician first sees the patient an actual cure can often be looked for while in the more advanced arthritis definite improvement and notably prevention of deformity is possible

It is the purpose of this paper to briefly comment on the types of chronic arthritis and then to present the general plan now followed in the Lahey Clinic for handling these cases The plan is in no sense original but is offered simply as a definite procedure for approaching the chronic arthritis Dogmatic rules are not possible in the treatment of chronic arthritis since each patient must necessarily present an individual problem It is emphasized that the joint symptoms for which the patient directly seeks relief are simply one of the manifestations of the disease To further quote the Committee At the present time no single infectious agent or any completely defined dietary deficiency or

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metabolic disturbance has been conclusively shown to be the sole cause of these disorders "

CLASSIFICATION

A great obstacle to better understanding of this disease is the widely divergent nomenclature employed in classifying the various types of chronic arthritis Confusion becomes more marked when writers discussing arthritis each make use of identical terminology to mean precisely opposite arthritic types To clarify this maze the American Commission now recognizes two types of chronic arthritis and a third or mixed type combining features of the two main groups These types are (1) *atrophic arthritis* (2) *hypertrophic arthritis* (3) *mixed types* To the literature published by the commission the reader is referred for detailed analysis of these types Some of the more significant group characteristics are

ATROPHIC ARTHRITIS (FIG 267)

Identified by multiple joint swelling atrophy of soft parts and pronounced disability most frequently seen in slender

Fig 267—Photograph of a patient with chronic multiple atrophic arthritis Note marked atrophy of the soft parts particularly about the shoulders and upper extremities Swelling of soft parts about joints of fingers is well shown

poorly muscled rather frail individuals who commonly exhibit evidence of emotional instability, and give a history of chronic constipation and chronic fatigue. In the early stages x-rays of such joints are negative save for increased density of the soft parts (Fig 268). In the advanced cases there is atrophy (Figs
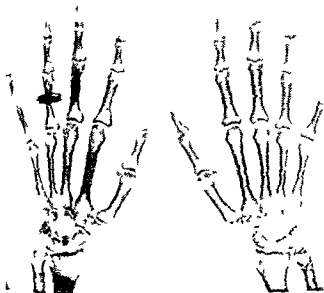

Fig 268 — An x ray of the hand of an early case of atrophic arthritis. The soft part swelling is evident about the mid interphalangeal joint. There is very slight atrophy of the bone, no joint change except in some of the terminal interphalangeal joints where narrowing is seen

269 270), or diminished density of the bone, narrowing of the joint spaces and progressive joint ankylosis. Histologically, free proliferation of the synovial membrane is seen, together with pannus formation while in late cases destruction and atrophy of bone and cartilage is evident going on to fibrous or bony ankylosis

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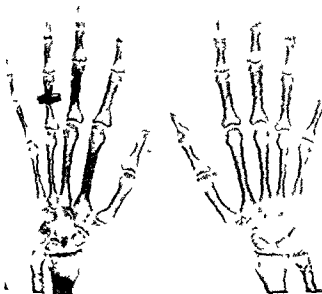

Fig 268 —An x ray of the hand of an early case of atrophic arthritis The soft part swelling is evident about the mid interphalangeal joint There is very slight atrophy of the bone no joint change except in some of the terminal interphalangeal joints where narrowing is seen

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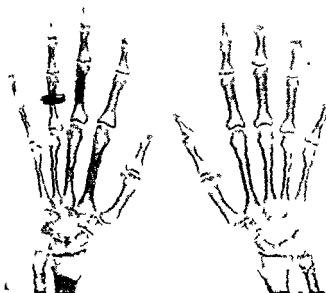

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Fig 269 —Photograph of hand of a relatively advanced case of multiple atrophic arthritis
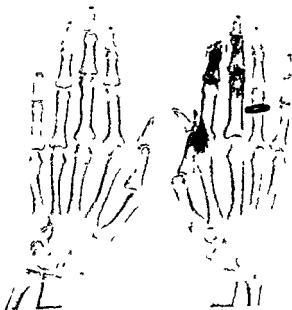
Fig 270 —x Rays of the same hand as shown in Fig 269 Note marked general zed bone atrophy

Fig 271 —x Ray of the knee of the same patient shown in Figs 269 270
Marked bone atrophy is evident joint destruction with pronounced
narrowing of the space is clearly shown

HYPERTROPHIC ARTHRITIS

More frequently seen in the robust somewhat obese healthy
appearing dynamic types who usually present relatively slight
swelling in one or more joints and as a rule only moderate disability Muscle atrophy is rare The incidence is from middle
age till death x Rays (Fig 272) show hypertrophic change in
the form of small exostoses or lipping at the joint margin The
soft part shadow is not increased In the later stages (Fig 273)
exostoses are marked and there is pronounced bone density from
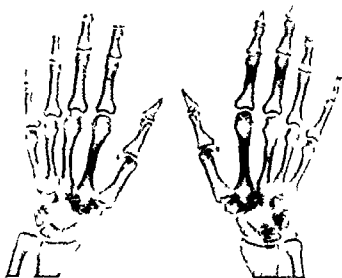local increased calcification The joint space may be irregular,
but ankylosis is not seen

Fig 269 Photograph of hand of a relatively advanced case of multiple atrophic arthritis

Fig 270 x Rays of the same hand as shown in Fig 269 Note marked general skeletal bone atrophy

Fig 271—x Ray of the knee of the same patient shown in Figs 269 2 0 Marked bone atrophy is evident extensive joint destruction with pronounced narrowing of the space is clearly shown

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Fig 2/2 —x Rays of the hand present ng very early hypertrophic ar thritis Sl ght l pp ng and very small exostoses can be seen around the mar gins of several of the jo nts There is no bone atrophy and no soft tissue re act on Compare with Fig 768
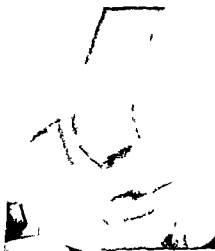

Fig 273 —x Ray of knee show ng moderately advanced hypertrophic arthritis of surfaces knee joint

MIXED TYPE

A Combination of the Above Two Forms

General Procedure—One of the first and most important re
quirements is a careful detailed history Such a record includes
not only the actual mode of onset of symptoms and subse
quent progression but also a detailed analysis of any and all
factors in the patient s environment which are—and have been—
productive of fatigue and emotional upset The importance of
fatigue in chronic arthritis cannot be overestimated Invariably
fatigue—mental or physical or both—intensifies the joint symp
toms In patients with relatively slight organic joint change re
moving the inciting cause of such fatigue results in marked relief
All arthritics benefit by such care These details are not acquired
in the first consultation but rather are they voluntarily offered
once the patient has confidence in the physician and is assured
of an interest in his (the patient s) condition

Then follows a very complete physical examination Accu
rate note is made of the body mechanics and of all joints with
any abnormality thereof together with a record of the possible
range of motion Evidence of vasomotor instability is sought as
a sign of disturbance in the sympathetic nervous system for
example abnormally pale or cyanotic or sweating hands and feet
pronounced blood pressure change with slight exertion unusual
coldness of the extremities Photographs illustrating the above
are well worth while and while our primary object is thus at hand to later
demonstrate progress It is a rare patient whose morale will not
respond to such evidence

The next step is a routine blood examination consisting of a
complete blood count smear and differential of a blood Wasser
mann nonprotein nitrogen sugar and uric acid In selected
cases blood cultures employing the clot method described by
Cecil and his coworkers have been tried The series is too small
to report in detail but so far the results have not been en
couraging Two to three complete urine check ups are done and
a basal metabolism carried out Finally x rays are ordered of
the teeth and the more seriously involved joints

Suggestive activity in possible foci of infection observed in

the initial examination are then investigated in detail The more
common such foci are teeth nose and throat nasal sinuses
ears lungs gallbladder and gastro-intestinal system The
genito urinary tract requires intensive review especially the
prostate in the male In the female a careful visual examination
of the vaginal canal should be done as well as the usual pelvic
to rule out old infection in the tubes A detailed menstrual
history is taken If the climacteric has been passed inquiry is
made regarding symptoms indicative of deficient ovarian secre
tion In this connection one encounters obese women past the
menopause complaining of bilateral knee joint discomfort and
of hot flashes The latter are often quite marked Amniotin
pessaries nightly for a ten day period once a month combined
with small amounts of thyroid and a diet to reduce weight often
cause marked improvement in such patients

Survey of the information thus gained will indicate the lines
along which treatment is directed as well as pointing out the
value of further examination For those individuals who in
addition to joint symptoms exhibit evidence of fatigue mental
or physical inability to meet environmental demands or in
general are well below par hospitalization is advised I believe
the great majority of patients suffering from chronic arthritis
are immensely benefited by an initial stay in the hospital for a
minimum period of two weeks and in severe cases for an appre
ciably longer time Such a plan permits complete bed rest
entire absence of any responsibility on the part of the patient
and allows intensive treatment as well as any further check up
or examination that may be indicated Economic or social con
ditions or both may preclude such treatment and then too
unless actually incapacitated the average arthritic does not feel
his condition merits hospitalization In the latter event if it
appears that more rapid progress would be made by such treat
ment it is up to the physician to explain the situation to the
patient that he in turn may realize the seriousness of his symp
toms and take sufficient action toward remedying them

In treatment of the joints one universal *initial require
ment is rest* In the hypertrophic joint such rest may be further

enforced by splinting for a short period, to be thereafter followed
by carefully supervised exercises In atrophic joints, however
careful guarded active motion is best   Heat efficiently admins
tered by infra red lamp is very helpful to improve local circulation
and can be followed by skilful massage for the same purpose and
also to maintain muscle tone   Muscle exercises are the next
step   Postural training for poor bodily mechanics follows

The more general treatment aims to correct abnormally func
tioning bodily systems as for instance the gastro intestinal tract
in patients complaining of chronic constipation   Nearly all
chronic arthritics require dietary management   Chart I illus

CHART I

SAMPLE DIET FOR CHRONIC ARTHRITIS

Breakfast

Cho

Coct

Lunch

verage head
nly d es nt

W e m lk or butterm k one glass

out d w e wheat bread an one pat of b t er

Dinner or Supper

Sup veg r t

a butter as lunch

One glass of whole mlk or butterm lk or one cup of coffee w th no sugar or cream
Avoid   Meats or fish wh ch are canned smoked salted or preserved   No pork no r w no
       & days eol er see b ead or tripe fowl as du k turkey goose to be taken very spar
       ngly
A f cond ments   All gra es
A l gr t es p es ell e c nfect n and jams as well as preserved syrups fru t
A l d ries and ce cre m t be taken only w t d n te perm s n
A l hot bread
A l hot bread
A l alcohol or malt dr nks
Drnk x x to e ght glasses of hot water between meals each day

trates the basic diet and particular attention is called to the
forbidden types of food   Emphasis is placed on a balanced food
intake high in vitamins and low in carbohydrates   Fried foods
and pastries are refused   Where weight reduction is indicated
the diet is so arranged   Laxatives are omitted   Colon irriga

the initial examination are then investigated in detail. The more common such foci are teeth nose and throat nasal sinuses ears lungs gallbladder and gastro intestinal system. The genito-urinary tract requires intensive review especially the prostate in the male. In the female a careful visual examination of the vaginal canal should be done as well as the usual pelvic to rule out old infection in the tubes. A detailed menstrual history is taken. If the climacteric has been passed inquiry is made regarding symptoms indicative of deficient ovarian secretion. In this connection one encounters obese women past the menopause complaining of bilateral knee joint discomfort and of hot flashes. The latter are often quite marked. Amniotin pessaries nightly for a ten day period once a month combined with small amounts of thyroid and a diet to reduce weight often cause marked improvement in such patients

Survey of the information thus gained will indicate the lines along which treatment is directed as well as pointing out the value of further examination. For those individuals who in addition to joint symptoms exhibit evidence of fatigue mental or physical inability to meet environmental demands or in general are well below par hospitalization is advised. I believe the great majority of patients suffering from chronic arthritis are immensely benefited by an initial stay in the hospital for a minimum period of two weeks and in severe cases for an appreciably longer time. Such a plan permits *complete bed rest* entire absence of any responsibility on the part of the patient and allows intensive treatment as well as any further check up or examination that may be indicated. Economic or social conditions or both may preclude such treatment and then too unless actually incapacitated the average arthritic does not feel his condition merits hospitalization. In the latter event if it appears that more rapid progress would be made by such treatment it is up to the physician *to explain the situation to the patient* that he in turn may realize the seriousness of his symptoms and take sufficient action toward remedying them

In treatment of the joints the one universal initial requirement is rest. In the hypertrophic joint such rest may be further

CARCINOMA OF THYROID ARISING IN DISCRETE ADENOMATA

Frank H. Lahey

The following 4 cases of adenomata of the thyroid showing potential malignancy with vessel ingrowth and also frank malignancy are employed as examples of malignant degeneration in previously existing benign adenomata and a discussion of the subject from a clinical aspect follows the abstract of these 4 cases

Case I—Mrs M S came to the clinic on November 28 1928, complaining of goiter She was fifty years of age She

F g 274 —Showing vessel ingrowth It is not easy to visualize the vessels in the slide Therefore the walls are indicated by arrows and the mass of tissue which has grown onto the intima is marked with an X

stated that there had been an enlargement of the thyroid gland for about fifteen years but that there were no symptoms asso-

tion is never employed If there is a long history of cathartic abuse the patients are placed on bowel management under the direction of the gastro intestinal service

Nonspecific intravenous protein therapy can be employed to advantage in patients who show an overaction of the sympathetic vasoconstrictor nerves and also in selected arthritic cases in whom an allergic background can be demonstrated Employed on the general run of cases such protein treatment has not been successful in our hands If a definite focus of infection is demonstrated as having a marked effect on the arthritis then a specific vaccine made from the predominating organisms of that focus may be tried Individuals who present the rheumatic fever syndrome notably those with heart involvement may be aided by salicylates Otherwise such drugs are employed simply as an anodyne

In reviewing the subject of chronic arthritis one is impressed particularly by the great significance of early recognition of the prodromal signs of the disease It is at this period in the patient s life that the greatest possible good can be done with the least expenditure of time and effort At this stage joint signs are usually not the chief complaint The picture is often that of a marked chronic fatigue worry or undue stress and strain resulting from inability of the patient to stand up under his mental or physical load There is evidence of generally lowered resistance to infection There are faulty body mechanics as poor posture generally inadequate musculature and chronic joint strain to be corrected by posture training muscle exercises combined with mechanical support as indicated The personal hygiene of the individual should be reviewed The habit of over indulgence in food too much exercise or inadequate balance between sleep and the hours of activity require adjustment Finally the influence of heredity should be kept in mind If there is a history of arthritis in the patient s family the patient may have a predisposition to the disease Early recognition of these cases followed by prompt appropriate treatment will immeasurably aid in reducing the present unnecessary and excessive social and economic loss from chronic arthritis

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Nonspecific intravenous protein therapy can be employed to advantage in patients who show an overaction of the sym pathetic vasoconstrictor nerves and also in selected arthritic cases in whom an allergic background can be demonstrated Employed on the general run of cases such protein treatment has not been successful in our hands If a definite focus of infection is demonstrated as having a marked effect on the arthritis then a specific vaccine made from the predominating organisms of that focus may be tried Individuals who present the rheumatic fever syndrome notably those with heart involvement will be aided by salicylates Otherwise such drugs are employed simply as an anodyne

In reviewing the subject of chronic arthritis one is impressed particularly by the great significance of early recognition of the prodromal signs of the disease It is at this period in the patient s life that the greatest possible good can be done with the least expenditure of time and effort At this stage joint signs are usually not the chief complaint The picture is often that of a marked chronic fatigue worry or undue stress and strain resulting from inability of the patient to stand up under his mental or physical load There is evidence of generally lowered resistance to infection There are faulty body mechan ics as poor posture generally inadequate musculature and chronic joint strain to be corrected by posture training muscle exercises combined with mechanical support as indicated The personal hygiene of the individual should be reviewed The habit of over indulgence in food too much exercise or inadequate balance between sleep and the hours of activity require adjust ment Finally the influence of heredity should be kept in mind If there is a history of arthritis in the patient s family the patient may have a predisposition to the disease Early recognition of these cases followed by prompt appropriate treatment will im measurably aid in reducing the present unnecessary and ex cessive social and economic loss from chronic arthritis

ciated with it Physical examination was negative except for the thyroid There was an adenoma of the right lobe 2 inches in diameter It was freely movable but firm At operation a d screte adenoma was removed with the usual technic described from this clinic (Figs 275 277) There were no clinical evi dences of malignancy seen The pathologic report of the excised goiter showed it to be made up of an undifferentiated fetal aden oma with blood vessel invasion demonstrating malignant char
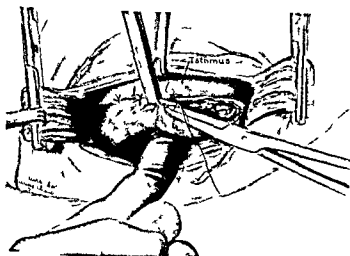

F g 277—The defect of the thyro d gland left after the reno al of the adenoma is be ng turned n and sutu ed so that no ooz ng or raw su faces a e left

acteristics She received postoperative x ra therapy and is no well without evidence of recurrence three years after oper ation

Case II—Mrs F B a forty four year old white woman first came to the clinic on September 23 1931 complaining of go ter She stated that for fourteen years she had had a sensa tion of fullness in her neck and that there had been some swelling wh ch had gradually increased in size She had had no symptoms of obstruction of her trachea or esophagus During the year
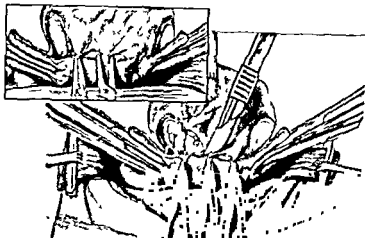
Fig 215 —In this illustration two snaps have been placed on the good thyroid tissue above and below the adenoma Incisions have been made which expose the shell of the adenoma and the thin layer of thyroid tissue which is over the adenoma has been grasped The grasped overlaying thyroid tissue in the main illustration is being cut away so that the adenoma with its shell of thyroid tissue about it is being exposed
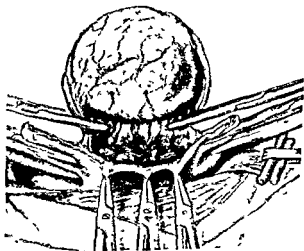

Fig 216 —The adenoma is almost entirely shelled out from its surrounding layer of thyroid tissue and the ties may be seen on the small vessel of the back layer of thyroid tissue over the region of the recurrent and parathyroid

ciated with it Physical examination was negative except for the thyroid There was an adenoma of the right lobe 2 inches in diameter It was freely movable but firm At operation a discrete adenoma was removed with the usual technic described from this clinic (Figs 275–277) There were no clinical evidences of malignancy seen The pathologic report of the excised goiter showed it to be made up of an undifferentiated fetal adenoma with blood vessel invasion demonstrating malignant char
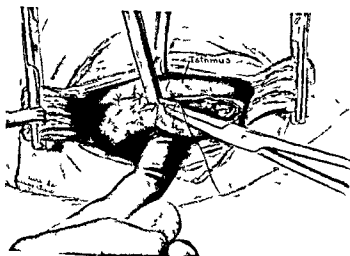

Fig 277—The defect of the thyroid gland left after the removal of the adenoma is being turned in and sutured so that no oozing or raw surfaces are left

acteristics She received postoperative x ray therapy and is now well without evidence of recurrence three years after operation

Case II—Mrs F B a forty four year old white woman first came to the clinic on September 23 1931 complaining of goiter She stated that for fourteen years she had had a sensation of fullness in her neck and that there has been some swelling which had gradually increased in size She had had no symptoms of obstruction of her trachea or esophagus During the year

prior to her coming to the clinic she had lost 10 pounds in weight
but she had been on a reduction diet Her past history was
essentially negative Physical examination revealed a well
developed and nourished woman Her heart and lungs were
negative Her thyroid was considerably enlarged but was sym
metrical It was nodular and the inferior poles could not be
felt on either side An x ray of the trachea revealed that it was
not deviated A clinical diagnosis of adenomatous goiter was
made and operation advised The preoperative metabolism was
+21 A left subtotal hemithyroidectomy was performed with
out incident but during the removal of the right lobe it was
found that the upper pole was very firm and adhered to the
trachea and larynx for an area not larger than a bean and
this small area of tissue was very firm and indurated A frozen
section of the suspicious tissue was done and the pathologist
reported that it resembled carcinoma In view of this diagnosis
the entire right lobe was excised great care being taken to pre
serve the right recurrent laryngeal nerve The patient made
an eventful recovery from her operation She has received
postoperative x ray treatment The pathologic report of the
tissue excised at operation revealed it to be an adenocarcinoma
of the alveolar type

Case III —Mrs A V a sixty seven year old white woman
entered the clinic on December 30 1931 complaining of goiter
She stated that she had had an enlargement of the left side of
her neck for from twenty to twenty five years *About four
months previously it had started to increase in size and had enlarged
quite rapidly* until the present time She had lost 12 pounds in
the past year Her appetite was good and her general health
was otherwise excellent Physical examination revealed a well
developed and nourished woman Her thyroid was enlarged to
four times normal size the left lobe being larger than the right
Both lobes were moderately firm and adherent to the trachea
The heart was moderately enlarged There was a systolic mur
mur at the apex and the aortic second sound was accentuated
The blood pressure was 175 105 A diagnosis of adenomatous

goiter with possible malignant degeneration was made at this time. At operation, the lower portion of the left lobe and isthmus were adherent to the overlying muscles and to the surrounding tissues behind and below. It extended slightly below the clavicle on this side and was freed with difficulty. It had all the clinical evidences of malignancy. The superior pole and the lateral veins were secured and divided and practically the entire left lobe was removed. There was a small amount of tissue at the lower pole which could not readily be delivered and was therefore left behind. The recurrent laryngeal nerve on the left side was visualized and care was taken not to injure it. The pathologic report of this specimen revealed it to be a giant cell carcinoma. The patient made an uneventful recovery from her operation and was discharged from the hospital seven days after her operation. Prior to her discharge a laryngeal examination revealed a left recurrent paralysis. Since the nerve was preserved we hope that this is but transient. She has been receiving x ray therapy.

Case IV —Mrs I M, thirty four years of age came to the clinic on December 29 1931 complaining of a swelling in her neck. She said that she had had a small swelling in her neck five and a half years. It had gradually increased in size during the past two years following the birth of her baby. The past history was essentially negative. Physical examination revealed a well developed and nourished woman of thirty four. There was an adenoma of the right lobe of the thyroid about the size of a lime; this was quite firm. At operation the right lobe of her thyroid was about twice normal size and there was a nodule about 3 cm in diameter at the lower pole which was very firm and adherent to the trachea. The nodule was excised and a frozen section obtained at once showed that it was probably malignant. In view of this finding the entire right lobe was excised. The recurrent laryngeal nerve was isolated and protected. The patient made a good recovery and was discharged seven days later. The pathologic report of the tissue excised at this operation revealed it to be a malignant papillary adenocystoma with

blood vessel invasion Laryngeal examination revealed that the vocal cords functioned normally The patient is to have x ray treatment and to be continued under it for some time

From the foregoing cases valuable lessons may be learned concerning adenomata of the thyroid and the dangers of malignant degeneration in them Practically all carcinomata arising in the thyroid gland arise in previously existing benign adenomata These adenomata usually are present for a good many years but as is shown in two of these cases this is not necessarily so the carcinomata in two of these cases being so small (about the size of a bean) and apparently arising in such small adenomata that they could not have been present for any great length of time

It is unfortunate that there are no distinguishing features whereby one may suspect the onset of malignant degeneration in a previously benign adenoma It is unfortunately possible in most instances to make a diagnosis of carcinomatous changes in previously benign adenomata of the thyroid only when the lesion has penetrated the capsule of the adenomata invaded the adjacent structures such as the prethyroid muscles and trachea and also the regional lymph glands at which stage they are hopeless from the point of view of cure

The whole subject of malignant degeneration in an adenoma of the thyroid has been a very confusing one We have known for a long time that even in the presence of no definite morphological evidence of carcinomatous degeneration nevertheless an occasional apparently benign adenoma of the thyroid would metastasize to distant parts This led continental pathologists to a classification of thyroid adenomata distinguished by the term malignant adenoma an obvious misnomer since a tumor is either an adenoma and benign or it is malignant and no longer an adenoma It was not until Dr Allen Graham called attention to the feature of vessel ingrowth within apparently benign adenomata that comprehension of this situation resulted He has shown that careful search of adenomata will frequently demonstrate areas where thyroid tissue has ruptured through the intima of the vessel and is growing within

the lumen of the vessel, an example of which is shown in Fig 274 Not every patient in whom vessel ingrowth is found will show malignant degeneration and distant metastases in fact but few will show this feature But careful search of those specimens of supposedly benign adenomata which have in spite of apparent harmlessness recurred with characteristic malignant features will rarely fail to reveal areas in which vessel ingrowth can be demonstrated

It must therefore be appreciated that one cannot judge these tumors solely by the hitherto accepted pathologic criteria One cannot with safety forecast by these criteria that the lesion is benign and will not recur Specimens must be searched also for vessel ingrowth and when found one can only say that they are potentially malignant and treat them as such watching them carefully for recurrences and treating them with x ray therapy where it is thought advisable It has been stated that as long as malignancy is confined to within the capsule of an adenoma it does not metastasize to the adjacent lymph glands It may however metastasize distantly by the blood stream Lymph gland metastases are said not to occur until the capsule of the adenoma has been perforated and the neighboring parenchyma involved

There are a few clinical features about adenomata of the thyroid particularly discrete adenomata of the thyroid which suggest that malignant degeneration has already taken place within the adenoma When a discrete adenoma is unduly firm even though it has none of the other features of malignant degeneration to be spoken of later one should suspect that it has become malignant in character Discrete adenomata of the thyroid when not malignant are either quite soft in consistency due to degeneration within them or are but moderately firm and elastic Any change therefore in such tumors in the way of increase in firmness of consistency should make one suspicious of the onset of malignancy within the tumor When a discrete adenoma of the thyroid which has hitherto been movable becomes fixed or when it loses the discreteness of outline which characterizes discrete adenomata of the thyroid one

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such a discrete tumor quite easy This type of tumor in which we have seen so much malignancy has some quite definite clinical features It is most often single It has a thick definite fibrous capsule The tissue contained within it varies in different tumors in its degree of differentiation grossly It is very much like adenofibroma of the female breast arising as it does within and surrounded by normal thyroid tissue and it is of this type of tumor that we speak when we state that 96 per cent of all the cancer of the thyroid which we see arises in a previously existing benign adenoma of the thyroid

We realize that in regions where goiter is endemic it may be difficult to distinguish particularly small discrete tumors of this type We wish also to stress that when we say, as we do that since practically all malignancy of the thyroid arises in previously existing benign adenomata of the thyroid and all such adenomata should be removed we do not mean that all goiters with tumors in them should be removed We mean all discrete usually single adenoma of the above described type should be removed In regions where endemic goiter is so common that the thyroids of nearly all patients are enlarged and many nodular the decision for or against removal would be by no means so easy and must at times be very difficult to decide upon unless one takes the position that all nodular goiters should be removed, a position which it seems to us would be difficult to justify

We are therefore of the opinion as the result of our experience with these thyroid tumors that since almost all of the malignancy of the thyroid arises in tumors which are quite definite and are benign for some time since there are no features whereby one may wait for the onset of malignancy and receive warning in time to remove them early enough to prevent recurrence since the mortality of their removal is almost nothing then all such adenomata should be removed as a prophylactic measure against the possibility of later malignancy of the thyroid

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unaccountably develops a change in voice with paralysis or
weakening of action of one of the vocal cords one should suspect
that malignancy has occurred within the adenoma perforated
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duced interference with the function of the cord on that side
and the consequent change in the voice When there is an
adenoma of the thyroid which has changed in shape or con
sistency and the regional lymph glands are firm and enlarged
one should of course additionally suspect the presence of malig
nant degeneration in the adenoma and in such a case not infre
quently the removal of such an adjacent lymph gland for
biopsy will confirm the diagnosis of carcinomatous degeneration

There has been considerable discussion as to the existence or
nonexistence of so called fetal or embryonal adenomata of the
thyroid Whether or not there are truly fetal or embryonal
adenoma our experience now with operations on several thousand
adenomata of the thyroid has demonstrated that there are two
types of tumors which appear in the thyroid which are quite
different grossly One is the so called multiple colloid adeno
matous goiter which is in all probability the end stage of a
degenerative process in the form of hyperinvolution and so
improperly termed multiple colloid adenomatous goiter The
best examples of these tumors or better stated perhaps with a
view to their origin these balls of tissue are those that appear in
advanced endemic goiters They are quite apt to be necrotic in
these centers They are surrounded by very thin and indefinite
capsules They are multiple usually numerous in number and
apt to be scattered quite symmetrically throughout the entire
gland

The other type of thyroid tumor which has been properly
or improperly termed fetal or embryonal adenoma is a quite
definite and quite different one Here in our part of the
country where endemic goiter is not common this type of tumor
is quite easy to distinguish since it usually occurs in an other
wise normal gland and so makes palpation and demonstration of

such a discrete tumor quite easy   This type of tumor in which
we have seen so much malignancy has some quite definite
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fibrous capsule   The tissue contained within it varies in different
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There has been considerable discussion as to the existence or nonexistence of so-called fetal or embryonal adenomata of the thyroid Whether or not there are truly fetal or embryonal adenoma our experience now with operations on several thousand adenomata of the thyroid has demonstrated that there are two types of tumors which appear in the thyroid which are quite different grossly One is the so called multiple colloid adenomatous goiter which is in all probability the end stage of a degenerative process in the form of hypervolution and so improperly termed multiple colloid adenomatous goiter The best examples of these tumors or better stated perhaps with a view to their origin these balls of tissue are those that appear in advanced endemic goiters They are quite apt to be necrotic in these centers They are surrounded by very thin and indefinite capsules They are multiple usually numerous in number and apt to be scattered quite symmetrically throughout the entire gland

The other type of thyroid tumor which has been properly or improperly termed fetal or embryonal adenoma is a quite definite and quite different entity Here in our part of the country where endemic goiter is not common this type of tumor is quite easy to distinguish since it usually occurs in an otherwise normal gland and so makes palpation and demonstration of

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THE POSITION OF THE TRACHEA FOLLOWING THE OPERATIVE REMOVAL OF SUBSTERNAL GOITER

Richard B. Cattell

The trachea is frequently changed in position and caliber by enlargements of the thyroid gland. Because of its cartilaginous rings it is a semirigid tube which permits it to be displaced at times without narrowing of the lumen. In the pres
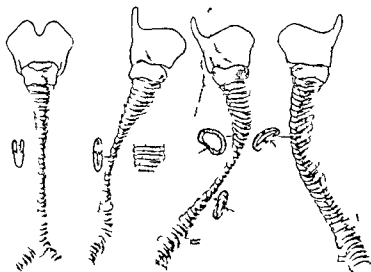
Fig. — Outline drawings illustrating diagrammatically the thyroid cartilages and tracheal rings. The trachea is seen in each in an en and in cross section the latter illustrating the size of the tracheal displacement deviation or compression is shown as well as n and of the trachea and larynx.

ent goiter it is subject to local deviation general displacement or rotation and torsion and compression or narrowing with or from side to side or anteroposteriorly. The larynx is similarly effected except for compression or narrowing (Fig. 2, 8).

able to withstand pressure from a goiter for a long period and yet retain its ability, due to its tracheal rings, to again assume its normal outline when the goiter is removed. At operation we have many times observed an immediate return to a normal outline following delivery of a goiter engaged in the thoracic strait. Atrophy of the tracheal rings from goiter is very rarely, if ever present. The so called "collapse of the trachea" so

Fig. 279—Cervical x rays of a patient with carcinoma of the thyroid. The sides of the thyroid cartilage are indicated by the letter t. The narrowed and displaced trachea is indicated by dots. At one point the trachea is irregular in outline indicating infiltration with carcinoma as indicated at B. Because of this the outline of the trachea will remain the same in this area after the removal of the right lobe.

often mentioned in the literature as a postoperative complication is we believe, more frequently due to an injury to one or both recurrent laryngeal nerves or to postoperative hemorrhage causing a return of pressure by distending the original site of the goiter. In carcinoma of the thyroid with direct invasion of the tracheal rings we have seen the true collapse and failure to restore a normal outline necessitating immediate tracheotomy (Fig 279)

An abnormal position may be present without being apparent
For this reason we have adopted the practice in the clinic of
routine cervical x rays in all patients with asymmetrical goiters
adenomatous goiter thyroiditis carcinoma and in those patients
in whom the inferior poles of the gland cannot be felt These
plates are taken to show the trachea and are taken with an
anteroposterior view as well as an oblique view which is not
truly lateral The air filled trachea is demonstrated clearly
and in addition substernal masses can be seen The impor
tance of locating the trachea by some means such as this can
readily be appreciated in those patients with carcinoma of the
thyroid where immediate tracheotomy under difficult operative
conditions may be necessary Death may result in such cases
during attempted tracheotomy unless one is able to determine
preoperatively its relative position

A change in position of the trachea may frequently be sus
pected from the clinical examination If the patient faces the
examining physician either standing or sitting upright the
point of the chin and the suprasternal notch are the ends of the
line at the middle of which the notch in the thyroid cartilage
should normally be felt These are constant landmarks whereas
the trachea can rarely be palpated in the presence of goiter If
the larynx is shown by this means to be to either side of the mid
line then a goiter on the opposite side will be present

The effects of thyroid pressure on the trachea were well
illustrated in the Surgical Clinics of North America for April
1931 by Dr Lahey In this paper it was clearly demonstrated
that in goiter involving both lobes the trachea was frequently
compressed from side to side With enlargement of the *isthmus*
backward displacement and flattening occurred *Prolongations*
of thyroid tissue were demonstrated passing backward from a
superior or inferior pole or from the posterolateral surface of a
lobe causing an anterior displacement or bowing of the trachea
seen in the oblique view *Unilateral substernal or intrathoracic*
goiter showed marked deviation and displacement to the oppo
site side with or without narrowing

In the absence of malignancy of the thyroid the trachea seems

able to withstand pressure from a goiter for a long period and yet retain its ability due to its tracheal rings to again assume its normal outline when the goiter is removed. At operation we have many times observed an immediate return to a normal outline following delivery of a goiter engaged in the thoracic strait. Atrophy of the tracheal rings from goiter is very rarely, if ever, present. The so called "collapse of the trachea," so

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Following removal of a substernal goiter where deviation has been demonstrated preoperatively by cervical x rays and the deviated trachea is palpable and visible at operation it is not common to see the trachea return to the normal midline position completely correcting the displacement although the outline is apt to be restored at once We have found this to be a gradual process A study has been made of a group of these patients with x rays taken at intervals after operation These results will be reported in detail later In the substernal space left after the removal of the goiter we believe it wise to place a cigarette drain loosely filling the cavity with gauze This is done to avoid infection of the mediastinum since rapid walling off results and also it serves to drain this blind space adequately until it closes by collapse and granulation from below upward When one realizes that the bottom of the cavity is frequently below the level of the arch of the aorta the importance is evident In the absence of such drainage we have seen serum accumulate in such a pocket sufficient to produce as great a tracheal deviation as was caused by the goiter x Rays taken with these substernal packs in place will show little if any diminution in the size of the cavity immediately postoperatively and there is slight if any return of the trachea at this time In the absence of drainage x rays taken postoperatively are very valuable if a serum accumulation is suspected

The trachea has usually returned to the midline in three months after operation The outline in the anteroposterior and oblique views may not be as regular as in the normal person but any variations are insufficient to produce symptoms In some cases of long standing substernal goiter the inflammatory changes resulting from hemorrhage or degeneration in the goiter may result in the production of sufficient scar tissue to prevent complete return This may be sufficient to show in the x ray plate Due to the common practice of folding over the remnants of thyroid tissue to the trachea local changes in the outline of the trachea may result These are not of practical importance We have been surprised in a few instances to read a paradoxical deviation to the opposite side in patients postoperatively This

when slight, may be accounted for by the large defect left by removal of the greater portion of the thyroid tissue on one side so that the trachea in returning toward the midline passes beyond it because of the pressure of a normal sized lobe A marked deviation to the opposite side, as has occurred in a few cases in our experience has resulted from an enlargement of the opposite lobe

The usual position after the operative removal of a substernal or asymmetrical goiter is well illustrated by the following case report and x ray illustrations

CASE REPORT

H M F, an unmarried librarian of forty three years came to the clinic in June 1931 complaining of a swelling in her neck

Fig 280 —A photograph of the patient reported showing the enlargement on the left side of the neck Only a portion of the goiter is evident since there was a large substernal projection

She had first noticed this eight years previously There had been a gradual increase in size without any periods of rapid growth She had noticed a feeling of pressure in her neck and had had

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left angle of the incision   The pathologist reported this as show
ing colloid adenomatous areas with degenerative changes and
without evidence of malignancy   She made an uneventful
recovery

Fig 282—Anterior cervical x ray taken four and one half months after
operation   The outline of the trachea is slightly irregular but the lumen is
adequate and the trachea is in the midline   No symptoms

She returned for an examination in four and a half months
at which time the cervical x rays were repeated   These showed
the trachea in the normal midline position (Fig 282)

frequent attacks of laryngitis Examination showed a marked
enlargement of the left side of the neck involving the left lobe
of the thyroid (Fig 280) Its cervical portion was about 4
inches in diameter It extended down behind the left clavicle
into the left substernal space It could be partially dislodged
with the fingers on swallowing Examination showed the thy
roid notch to be displaced well to the right of the midline of
the neck The right lobe of the thyroid felt normal An x ray
of the cervical region (Fig 281) showed a marked general dis

F g 281 —Anten r cerv cal x ray of the patient reported show ng the marked
d splacement to the r ght an l sl ght narrow ng of the trachea

placement of the larynx and trachea most marked opposite the
fifth and sixth cervical vertebrae but continuing to the right of
the midline into the chest below the arch of the aorta There
was little compression from side to side but no anterior dis
placement and no flattening At operation a discrete adenoma
occupying the greater portion of the left lobe was found descend
ing beneath the clavicle on the left side It was removed *
draining the space left with rubber dam brought out through the

* See F gs 2 ? ?

left angle of the incision   The pathologist reported this as show
ing colloid adenomatous areas with degenerative changes and
without evidence of malignancy   She made an uneventful
recovery

Fig 282 —Anterior cervical x ray taken four and one half months after
operation   The outline of the trachea is slightly irregular but the lumen is
adequate and the trachea is in the midline   No symptoms

She returned for an examination in four and a half months
at which time the cervical x rays were repeated   These showed
the trachea in the normal midline position (Fig 282)

CARCINOMA OF THYROID ORIGIN IN CHILDREN

RICHARD B CATTELL

MALIGNANT tumors of thyroid origin are very rare and
unusual in children We have treated three such patients at the
Lahey Clinic whose ages were six eleven and thirteen years
respectively All three patients were seen during 1930 We have
occasionally observed the occurrence of thyroid malignancy in
young adults and this experience has led us to believe that it is
a distinct possibility at any age The importance of removing
premalignant and discrete tumors of the thyroid before any of
the clinical manifestations of malignancy are present has been
frequently emphasized from this clinic and a discussion of it
by Dr Lahey will be found on page 795 of this volume Clute
and Smith [1] and Clute and Warren [2] have reported the clinical
course the pathologic types and grades of malignancy in these
cases of thyroid cancer and it seems of interest to present these
aspects in the 3 cases of thyroid malignancy in children

CASE REPORTS

Case I —P P an American boy of six years came to the
clinic in February 1930 because of swelling in the neck Two
months previously he had fallen striking the left side of his
neck against the edge of a chair There were no external signs
of injury at this time One month before our examination his
mother noted a pea sized swelling in the midline of the neck
This had gradually increased in size but there had been no dis
charge externally Physical examination showed no abnormality
except for the findings in his neck Over the midportion of the
hyoid bone was a fluctuant slightly tender symmetrically rounded
mass 3 cm in diameter It was freely movable upon swallow
ing and appeared to be just beneath the skin At operation

epithelial cells suggesting thyroglossal origin   The wound has remained healed and there has been no evidence of recurrence either of the sinus nor of malignancy during fifteen months

Case II —R F , an American girl of eleven years came to the clinic in January, 1930 because of lumps on the right side

F g 284 —Drawing made at the time of operation (Case II) showing the extent of the aberrant thyroid tissue lateral to the internal jugular vein and beneath and behind the sternomastoid muscle

of her neck   One and a half years previous to examination these had been noted in this position   Her tonsils and adenoids had been removed without effect   Nine months previously a

February 12 1930 a thyroglossal cyst was demonstrated and removed together with 2 cm of the middle portion of the hyoid bone and a cone of muscles extending up to the foramen cecum in the floor of the mouth The tract leading upward from the cyst passed through the center of the hyoid bone Dr Shields Warren reported this as a *thyroglossal cyst containing an area of adenocarcinoma (Fig 283*)* arising from the thyroglossal duct Because of this finding sixteen days later a secondary

Fig 283—Section taken from the wall of the thyroglossal cyst (Case I The *e a e* islands of epithel al cells *n a* dense s oma Th s *an* adenoca c noma of low grade mal gnancy

radical resection was done removing larger portions of the hyoid bone and a larger cone of muscles at the base of the tongue All t ssue was removed down to the thyrohyoid mem brane The tissue removed showed no evidence of carcinoma The lesion again recurred with the wound failing to heal com pletely

out D
chronic

* *The photomicrographs were made by Dr Sh elds Warren*

epithelial cells suggesting thyroglossal origin   The wound has remained healed and there has been no evidence of recurrence, either of the sinus nor of malignancy during fifteen months

Case II.—R F, an American girl of eleven years, came to the clinic in January, 1930, because of lumps on the right side

Fig 284 —Drawing made at the time of operation (Case II) showing the extent of the aberrant thyroid tissue lateral to the internal jugular vein and beneath and behind the sternomastoid muscle

of her neck   One and a half years previous to examination these had been noted in this position   Her tonsils and adenoids had been removed without effect   Nine months previously a

biopsy was done and the gland was reported negative Three
and a half months before a second gland was taken which was
reported by Dr S B Wolbach as papillary cyst adenoma of
probable thyroid origin Following this she received x ray treat
ment for one and a half months which diminished their size
somewhat There were no other symptoms and she had not
lost weight With a preoperative diagnosis of lateral aberrant
thyroid a radical dissection of the right side of the neck was

Fig 285—Section of aberrant thyroid nodules (Case II) showing the
characteristic structure of papillary adenocystoma undergoing malignant
degeneration with areas of adenocarcinoma

carried out, removing the glands which extended from the mas
toid process down to the level of the clavicle (Fig 284) The
right lobe of the thyroid was found to be involved by a similar
process so that the entire right lobe was removed together with
the internal jugular vein The vagus, phrenic and hypoglossal
nerves and sympathetic trunk were all seen and preserved The
recurrent laryngeal nerve was visualized and dissected free with
out injury She made an uneventful recovery except for a
postoperative abscess in the incision Dr Shields Warren

reported these glands and the thyroid showing papillary adeno carcinoma (Fig 285) of lateral aberrant thyroid origin She received extensive postoperative x ray therapy for six months and has now been well two years without evidence of recurrence There is a "winged scapula on the right with a trapezius atrophy due to an injury of the spinal accessory nerve

Case III—B P an American boy of thirteen was seen in October 1930 for a swelling in the neck In the spring of 1930 he had had a complete physical examination without evidence of thyroid enlargement Three and a half months before examination while swimming he was kicked on the right side of his neck and shortly after his family noted the swelling present At this time his family physician discovered a swelling 2 cm in diameter in the right lobe of the thyroid For the next three months he was given iodine in the form of Lugol's solution with repeated measurements of the circumference of his neck There was a gradual increase For two months he had complained of shortness of breath during play but had had no difficulty in swallowing There had been little change in weight At the time of our examination he appeared healthy and well developed but there was a marked respiratory wheeze and stridor There was a hard mass occupying all of the region of the right lobe of the thyroid extending over into part of the isthmus measuring about 3 inches in diameter It was very hard and smooth but was not fixed to the deep structures in the neck It did not seem to extend below the clavicle The left lobe was normal to palpation The firmness suggested calcification but this was ruled out on the basis of the brief duration and by cervical x rays The latter showed the trachea considerably deviated to the left in front of the fourth cervical to the second dorsal vertebrae and its lumen was markedly narrowed from side to side so that less than one fourth of its original diameter remained In the oblique view it was curved backward slightly but its diameter was not narrowed in this plane A diagnosis of probable carcinoma of the thyroid was made At operation the prethyroid muscles were found infiltrated with carcinoma and

biopsy was done and the gland was reported negative Three and a half months before a second gland was taken which was reported by Dr S B Wolbach as papillary cyst adenoma of probable thyroid origin Following this she received x ray treatment for one and a half months which diminished their size somewhat There were no other symptoms and she had not lost weight With a preoperative diagnosis of lateral aberrant thyroid a radical dissection of the right side of the neck was

Fig 285—Section of aberrant thyroid nodules (Case II) showing the characteristic structure of papillary adenocystoma undergoing malignant degeneration with areas of adenocarcinoma

carried out removing the glands which extended from the mastoid process down to the level of the clavicle (Fig 284) The right lobe of the thyroid was found to be involved by a similar process so that the entire right lobe was removed together with the internal jugular vein The vagus phrenic and hypoglossal nerves and sympathetic trunk were all seen and preserved The recurrent laryngeal nerve was visualized and dissected free without injury She made an uneventful recovery except for a postoperative abscess in the incision Dr Shields Warren

months in spite of further x ray treatment the growth recurred at a very rapid rate which was followed by extensive involvement of the mediastinum obstructing his trachea low down   This resulted in pneumonia and death thirteen months after operation

These 3 patients of carcinoma of thyroid origin in children have little in common with each other   The small area of carcinoma in the thyroglossal tract of Case I was of a low grade malignancy   It was removed quite early and it was well local ized   We feel sure that the third radical operation was neces sary because of a recurrence of an ordinary thyroglossal sinus and not because of any possible malignancy present since there was none evident after the primary operation   The second operation was done of course to make certain that all tissue involved by the malignant process was thoroughly removed   It is of interest in this connection that this is the only recurrence in over fifty consecutive thyroglossal cyst operations in whom the radical operation was performed [3]   There is no anticipation of a recurrence in this patient   The second patient had a malig nant tumor arising from a lateral aberrant thyroid   The clinical course and treatment of these cases has been reported in detail by the writer [4]   These are of a relatively low grade of malig nancy   In the 13 patients whom we have operated upon in the clinic a true recurrence has not been seen in any of them although some have been followed well over the usual five year period   It is probably impossible to remove all of the involved tissue when these lateral aberrant thyroid tumors are distributed all along one side of the neck as in this patient   However our experience in following these patients having as complete a removal as possible followed by postoperative x ray therapy has failed to show that it has caused death in a single instance   In spite of the extent of the lesion in this girl there is a distinct possibility that she will remain free from recurrence   The third patient reported resembled very much the clinical course of thyroid malignancy in adults   The clinical course in this case resembles that of the group of adults studied by Clute and Warren [2] that had carcinoma of the small cell type   As so often occurs with malignant tumors in children in other sites this

very difficult to free Soon after the beginning of the operation
in spite of ethylene anesthesia with a closed apparatus with
which positive pressure was applied, his breathing became
totally obstructed and the anesthetist was unable to force air
into the lungs By means of the previous knowledge of the posi
tion of the trachea * as shown by the cervical x rays, sufficient
cancerous tissue was quickly removed exposing the trachea It
was ribbon like in outline with only a ridge presenting and a
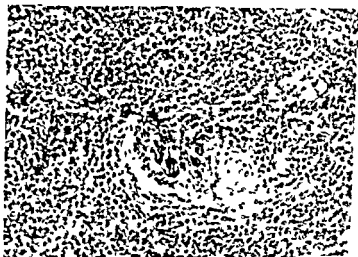

Fig 286 —Section from carcinoma of the thyroid (Case III) showing a
small cell carcinoma with evidences of rapid growth The cell structure is
difficult to identify as carcinoma and resembles lymphosarcoma closely

tracheotomy was done quickly with relief of the obstruction
A few days later an additional portion of the cancerous tissue
was removed by cautery Dr Shields Warren reported the
excised tissue as carcinoma of the thyroid of the small cell
type (Fig 286) He received extensive postoperative x ray
therapy with marked diminution in the size of the swelling Six
months after operation no swelling could be felt in the neck and
a plate of his chest showed little or no involvement In nine

* See Fig 2 9 page 80

DELAYED OSSIFICATION IN HYPOTHYROIDISM

Richard B. Cattell and Frank B. Ramsey

Normal thyroid function in childhood is essential for normal growth In the presence of hypothyroidism during the growing period there is a delay in the appearance of the ossification centers The mental development and general appearance of such patients are usually characteristic while the bony changes

Fig 28 —Photograph in the anterior view showing a large projecting goiter on the right side and a smaller enlargement on the left side

are less evident and less commonly understood This delay in ossification as a result of hypothyroidism is well illustrated by the following patient

Case Report—G B an American boy of eleven years came to the clinic in December 1931 because of a large tumor in his

tumor which was of a high grade of malignancy, brought on a rapid termination in spite of all therapy Operation did prolong his life and gave him thirteen months of comfort

SUMMARY

The occurrence of carcinoma of thyroid origin in 3 children is reported Carcinoma of the thyroid may occur at any age When it corresponds in type and grade of malignancy as seen in adults its course is very similar

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RICHARD B CATTELL AND FRANK B RAMSEY

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Fig 288 —Photograph in profile showing the relative enlargement of the right lobe

Fig 289 —Cervical x ray showing tracheal deviation to the right with slight narrowing

neck He had always lived in Vermont His father stated that a small lump had been noted in the right side of his neck soon after birth and there had been a gradual enlargement of it throughout his childhood During the past six months the enlargement had been more rapid and he had lost 9 pounds During the past year a smaller similar lump had appeared in the left side of the neck His development during childhood was normal but

Fig 290.—Oblique view showing displacement backward and slight compression of the trachea

had been delayed during the years of school age His mental development had been normal for his age and at the time of his visit to the clinic he was doing satisfactory school work in the fourth grade Neither parent had goiter nor had the family lived in a region where goiter was endemic

On physical examination he appeared poorly developed with a pale dry skin He weighed 46 pounds while his height was

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fourth grade Neither parent had goiter nor had the family
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On physical examination he appeared poorly developed with
a pale dry skin He weighed 46 pounds while his height was

47 inches His mental development appeared normal for his age There was a large, smooth, lobulated, *soft tumor occupying all of the right side of the neck extending upward along the right ramus of the mandible in its upper limits as well as extending across the midline* (Figs 287, 288) A small tumor 1½ inches in diameter was felt in the left lobe An x ray of the cervical region showed the trachea deviated to the right (Fig 289) as well as
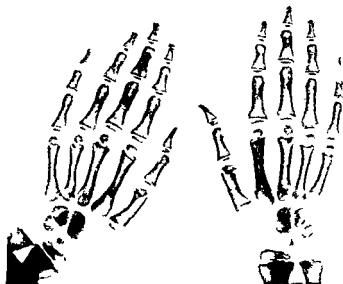

Fig 291 — x Ray plate of the hands of the boy reported in this paper At age eleven and a half the ossification centers of only four carpal bones are seen According to the progress of ossification his age is five years

posteriorly *but without narrowing of the lumen* (Fig 290) This deviation occurred toward the side with greatest enlargement Laryngeal examination showed the larynx and trachea to be displaced to the right side with slight edema of the cords The cord action was normal The basal metabolic rate was +12, the blood cholesterol 212 mg the red blood count 5 200 000 and the hemoglobin 90 per cent x Ray examination of the hands knees and ankles showed the epiphyseal development and

ossification centers of a child of five years (Figs 291 293)
For comparison the x ray pictures of a child of the same age are
included (Figs 294-296)

At operation the right lobe of the thyroid was found to be
markedly lobulated and enlarged to the size of a large orange
The surface was covered by many large dilated veins The
greater portion of this lobe was removed but a relatively large

Fig 292—The boy with hypothyroidism shows no ossification center in the patella It is beginning at the end of the fibula

remnant was left A small localized enlargement was removed
from the left lobe The remnants that were left were about twice
the size of the normal thyroid Postoperative recovery was
uneventful (Fig 297) and six days after operation the basal
metabolic rate was +8

This boy did not present the usual physical or mental char
acteristics of cretinism Skeletal development had been delayed
At the time of our examination the metabolic rate was +12 and

47 inches   His mental development appeared normal for his
age   There was a large, smooth, lobulated, soft tumor occupying
all of the right side of the neck extending upward along the right
ramus of the mandible in its upper limits as well as extending
across the midline (Figs 287, 288)   A small tumor 1½ inches in
diameter was felt in the left lobe   An x ray of the cervical region
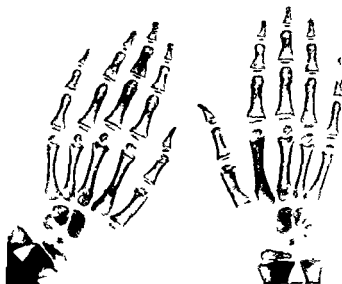showed the trachea deviated to the right (Fig 289) as well as

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The cord action was normal   The basal metabolic rate was
+12, the blood cholesterol 212 mg   the red blood count 5 200 000
and the hemoglobin 90 per cent   x Ray examination of the
hands knees and ankles showed the epiphyseal development and

goitrous parents This form is usually associated with idiocy, dwarfism, characteristic physical features and may be with or without goiter These children are rarely born cretins although rare cases of congenital cretinism have been reported They usually begin at the age of one or two years associated with
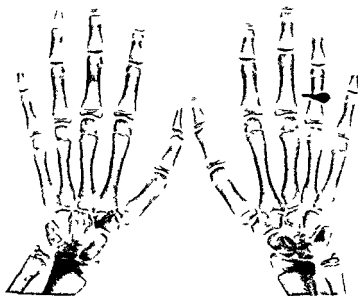

Fig 294.—x Ray plate of the hands of a girl age eleven with exophthalmic goiter (primary hyperthyroidism) Note the complete ossification of all the carpal bones a complete development of the ossification at the end of the radius The ossification center at the end of the ulna is present in this girl while absent in the boy with hypothyroidism

degenerative changes in the thyroid Sporadic cretinism according to Knaggs causes the body to be stunted The parents do not have goiter and no hereditary or environmental cause can be demonstrated Goiter is rarely present in this form The third form of cretinism known as cachexia strumipriva results from the operative removal of a considerable portion of the

after operation in spite of the removal of a large amount of the thyroid tissue present was +8 The cholesterol determination however was somewhat elevated This is a consistent finding in myxedema The x rays of the bones indicated a long standing hypothyroidism This patient is an example of sporadic cretinism

F g 293 —The foot of the boy w th hypothyro d sm shows no separate oss ficat on center n the os calc s

Cretinism is a condition associated with a deficiency in thy roid function that is present in early life resulting in defective mental and physical development It may be divided as sug gested by Knaggs [1] into three forms—the endemic the sporadic and the operative form known as cachexia strumpriva The endemic form occurs in goiter belts and in children born of

although most marked in the sporadic form   The ossification
centers are very late in making their appearance in the cartilag
inous epiphyses and when they do appear they grow slowly
This is well shown in the accompanying plates (Figs 291 293)
The delayed growth of the bone has been demonstrated by
Wegelin to be due to a persistence of the cartilaginous synchron
doses beyond the growth age and the inadequate development
of the cartilaginous absorbing medullary spaces   In the sporadic
cases the ossification centers may come to a standstill and the

Fig 29 —Photograph taken of the patient reported s x days after operation
There is still consideral le edema of the sk n flap

epiphyses remain cartilaginous until the end of life   Knaggs
reported a sporadic cretin aged five with absence of the ossifica
tion centers of the wrist bones which is very similar to the con
dition found in our patient

The presence of a large goiter in our patient is inconsistent
with the commonly described cases of sporadic cretinism   His
general appearance his mentality and the basal metabolic rate
were within normal limits   The blood cholesterol his small
size and the delayed epiphyseal development places him defi
nitely in the group of children with hypothyroidism   Unques

Fig 295 —The girl of the same age has a fully developed patella

Fig 296 —The girl of the same age has complete development of all tarsal bones with development of the separate center on the os calcis

thyroid gland during childhood with insufficient being left for normal function

The skeletal changes in cretinism are the same in all forms

CHOKING AS A SYMPTOM OF GOITER

Lewis M. Hurxthal

— — —

CHOKING is a frequent complaint of patients with any type of goiter. It is always important, therefore, to analyze this symptom to find out just what meaning the patient wishes to convey. In a general way the following questions will serve to elicit the true nature of the ailment.

1. Does choking occur at the sight of food or in an attempt to eat?

2. Does choking occur with emotional upsets?

3. Is the symptom associated with exertion as well as emotion?

4. Is there associated substernal distress or radiation of painful sensations to the arms?

5. Does turning the head to one side or the other or raising the arms cause choking? Does it occur during sleep when the head falls to one side or the other?

6. Is there dyspnea associated with the symptom? If so, is there stridor?

With these leading questions followed up by more detailed investigation the cause of the symptom can usually be assigned to one of the three main causes of choking in patients with goiter, namely, the heart, the trachea or larynx, or neurosis. It must not be forgotten, however, that one or more causes may be present at the same time.

To the lay mind any unusual sensation in the neck might suggest goiter as a possible cause. This is especially apt to be true if there is a fullness of the neck from a transverse fold of fat or a true enlargement of the thyroid gland. Actually choking is not a common manifestation of goiter. When it does occur as the result of thyroid enlargement, it is usually as the result of

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tionably hypothyroidism had been present for a considerable period of time during his childhood Operation was performed because of the pressure on the trachea and because of the large size of the goiter It is important in these patients to leave as large remnants as are consistent with a good cosmetic result (Fig 297) It has been observed many times in the clinic that the removal of this amount of thyroid tissue in adenomatous goiter does not materially affect the basal metabolic rate post operatively

In case operation becomes a necessity in children on account of pressure, hyperthyroidism or very large goiter it is important that sufficient thyroid tissue be left to prevent the development of cachexia strumipriva and its associated symptoms The basal metabolic rate must be followed throughout childhood at frequent intervals and if hypothyroidism develops sufficient thyroid extract must be administered to obtain normal growth and development

them off probably long before anything serious might develop as the result of the goiter

The choking due to heart disease is brought on by exertion or as in neurosis by emotion Nocturnal dyspnea a grave cardiac sign may be associated with choking When a patient has at the same time a large goiter particularly when it is intra thoracic the decision may at times be difficult

Large intrathoracic goiters may cause choking particularly where there is evidence of retarded venous flow Tracheal pressure as shown by x ray need not be present in these cases to account for choking Carcinoma arising in a substernal goiter may give this particular clinical picture Before dilatation of the veins becomes marked the differentiation between choking from heart disease and carcinoma may be confusing

Thus it is important to have a thorough cardiac study where there exists the least doubt Thyroid toxicity arising from an adenomatous goiter in elderly people is often difficult to deter mine One must do this after careful clinical examination and history rather than depending on the basal metabolic rate should it prove to be above normal Hypertension and cardio vascular disease will often give a moderate elevation of the basal metabolic rate It has been our experience and this I wish to stress particularly that *when we have been in doubt as to the presence of clinical toxicity but have advised surgery because we felt it offered the patient the only hope of improvement the results have been uniformly disappointing*

There are undoubtedly many cases in which thyroid toxicity is not suspected by the attending physician These have been labelled cases of masked or latent hyperthyroidism We feel however when these cases are investigated in detail hyper thyroidism when present can be diagnosed with few exceptions on clinical examination It is not because they do not show signs or symptoms of thyroid toxicity but because they do not display the marked activation restlessness and eye signs which would enable them to be diagnosed across the room If thyroid toxicity is present surgery is indicated With hyperthyroidism choking sensation may come from the emotional state induced

direct tracheal compression Often the trachea already narrowed to a marked degree may be completely compressed if the head is bent to one side or another pulling the trachea taut over a large adenoma or adenomatous goiter which is lodged beneath the clavicles Occasionally a small plug of mucus may be aspirated to the narrowed portion and lodge there completely shutting off the breath Pressure may also be caused by chronic thyroiditis Edema of the neck and head from intrathoracic goiter or carcinoma is not infrequently seen when these types of thyroid enlargement are encountered

By far the most frequent cause of a choking sensation is emotion Following this in frequency comes heart disease When heart disease is responsible it is frequently of a serious nature For this reason it deserves special emphasis

The primary object of a patient seeking advice is the relief of symptoms It is therefore the duty of the surgeon to give the patient reasonable assurance as to what may be expected following surgical treatment As stated before it is important that a careful analysis of the symptom under discussion be made before informing the patient what he may hope for as the result of a proposed operation Frequently we are confronted with a patient who has a goiter which for various reasons should be removed yet whose main complaint choking is purely an emotional reaction and totally unrelated to the thyroid enlargement Or we may discover heart disease or even disease of the larynx to be the real cause In these instances one must be careful to point out the possible relationships and just why surgery is advised or not advised In spite of this I have had patients reveal some time after operation when all their old symptoms returned that they were so firmly convinced their goiter was the cause of their trouble that they went ahead with the operation hopeful of relief rather than for any reason we had stated

We have rejected patients seeking surgical removal of non toxic goiter because of underlying heart disease These patients are naturally disappointed but it is far better to leave them alone when they have cardiovascular disease which will carry

them off probably long before anything serious might develop as the result of the goiter

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by it or choking may come from the drive of hyperthyroidism on a damaged heart just as the drive of hyperthyroidism increases angina or brings it out when under normal circumstances nothing short of the severest emotion or exertion would reveal it

Thus all patients with goiter who complain of choking in addition to the usual careful history and physical examination should be eligible for an examination of the larynx x ray of the trachea heart and chest and an electrocardiogram In this way the various pitfalls can be eliminated and one can then tell the patient what symptoms will be relieved by operation

LEUKEMIA MASKED AS HYPERTHYROIDISM

O J Menard

It is well known that the basal metabolism is frequently elevated in leukemia In hyperthyroidism the elevated metabolism is usually associated with well marked features of thyroid disturbance so that there is rarely confusion in differentiating it from leukemia Previous studies by others have shown that the relapse in leukemia may show its first indication by a rise in the basal metabolism and this occurs before an appreciable increase of white cells in the blood If the presenting symptoms and signs are weight loss increased warmth irritability exophthalmos, tremor glycosuria with enlarged thyroid gland with no glandular or splenic enlargement and an elevated basal metabolic rate, one is led to think that hyperthyroidism is present Leukemia would not be suspected especially if the blood counts do not show much deviation from normal Two such patients were seen at the Lahey Clinic within three years In neither case was thyroidectomy performed

Case I —Mr H W , aged fifty one years was seen in June, 1930 His chief complaint was fatigue and loss of weight From June to November in 1927 he lost 65 pounds At that time he perspired very profusely had a good appetite and was told by his consulting physician that he had diabetes In 1929 he was seen again by another physician who found 6 per cent sugar in his urine and a blood sugar of 300 mg By dieting his glycosuria was controlled without insulin In June 1930, he was seen at the Lahey Clinic complaining of nervousness, palpitation, and precordial pain

On physical examination he had a warm moist skin There was a tremor of the extended fingers His pulse was 106 The

systolic blood pressure was 110 and the diastolic was 60 The heart was hyperactive The sounds were snappy The thyroid gland was firm and felt hyperplastic A basal metabolism at this time was −2 weight 164 pounds The urine contained 1 per cent sugar Blood counts were normal The glycosuria was controlled without insulin on a diet containing 250 Gm of carbohydrates and he was advised to take 5 drops of Lugol's solution daily He was seen a few weeks later and he thought that he felt better with the iodine His weight was sugar free He was seen again in September 1930 His weight was 150 pounds He was sugar free and was still taking 5 drops of Lugol's solution daily but had not made any particular improvement He was seen again in January 1931 At this time he was advised to discontinue the Lugol's as it was not benefiting him In March 1931 his weight was 153 pounds his pulse was 100 and he complained again of precordial pain From this time on to September 1931 he began to gradually lose weight At this time his weight was 129 pounds He had more palpitation pulse was 120 and the thyroid gland felt firmer and even more hyperplastic than on previous occasions He was advised to enter the hospital for a further metabolism study and was advised to have a thyroidectomy His metabolism test was +29 pulse 120 weight 129 pounds On routine blood count at this time it was found that the white blood count was 24 000 and the differential count showed 60 per cent polynuclears 10 per cent mono cytes Repeated count the next day showed a 36 000 white blood count with the same findings in the differential He was running a normal temperature no evidence of infection could be found no glandular enlargement and the spleen and liver were normal in size by examination and x ray Because of the high white count and the myelocytes we felt sure that he had myelogenous leukemia and was started on Fowler's solution with increasing doses While on this medication for one month his basal metabolism dropped to +13 weight increased to 145 pounds the pulse rate was 80 and the white blood count was 4400 and the patient admitted that he had not felt so well for the last five years At this time there were no clinical features

of hyperthyroidism although the gland was still enlarged and firm

Case II—Mrs M T age twenty eight years was seen in July 1929 This patient complained of nervousness and prominence of her eyes

There was considerable language difficulty in taking this history as the patient was a Syrian and the details were certainly not reliable She had lost about 16 pounds in two months She perspired rather profusely was very irritable and during the past month had noticed that her left eye was becoming more prominent On examination there was a stare with exophthalmos the left more so than the right The skin was warm and moist and there was a tremor of the extended hands The thyroid was only slightly enlarged and did not appear particularly hyperplastic The pulse was 96 blood pressure 126 65 The heart and lungs were normal The abdomen was negative The spleen and liver were not enlarged

She presented doubtful features of hyperthyroidism and was advised to enter the hospital for a basal metabolism and further studies The basal metabolic rate was +31 pulse 116 and weight 114 pounds but again we did not believe that the picture was that of thyroid disturbance On careful examination the eye grounds showed minute hemorrhages with a slight choking of both disks An x ray of the skull was negative Blood counts taken showed a white blood count of 10 000 There were about 10 per cent eosinophils but no myelocytes were seen Hemoglobin was 90 per cent Two days later another white blood count was taken and this was 24 700 The smear showed 60 per cent myelocytes A repeat blood count two days later was 48 000 with a large number of myelocytes

Discussion Two cases of leukemia with signs and symptoms of hyperthyroidism are presented—the leukemia was masked as hyperthyroidism Case I showed nothing on the clinical examination to suggest leukemia as all of the facts present indicated hyperthyroidism i e the weight loss the tremor tachycardia increased warmth hyperplastic gland elevated

systolic blood pressure was 110 and the diastolic was 60 The heart was hyperactive The sounds were snappy The thyroid gland was firm and felt hyperplastic A basal metabolism at this time was −2 weight 161 pounds The urine contained 1 per cent sugar Blood counts were normal The glycosuria was controlled without insulin on a diet containing 250 Gm of carbohydrates and he was advised to take 5 drops of Lugol's solution daily He was seen a few weeks later and he thought that he felt better with the iodine His urine was sugar free He was seen again in September 1930 His weight was 160 pounds He was sugar free and was still taking 5 drops of Lugol's solution daily but had not made any particular improvement He was seen again in January 1931 At this time he was advised to discontinue the Lugol's as it was not benefiting him In March 1931 his weight was 153 pounds his pulse was 100 and he complained again of precordial pain From this time on to September 1931 he began to gradually lose weight At this time his weight was 129 pounds He had more palpitation pulse was 120 and the thyroid gland felt firmer and even more hyperplastic than on previous occasions He was advised to enter the hospital for a further metabolic study and was advised to have a thyroidectomy His metabolism test was +29 pulse 120 weight 129 pounds On routine blood count at this time it was found that the white blood count was 24 000 and the differential count showed 60 per cent polynuclears 10 per cent myelocytes Repeated count the next day showed a 36 000 white blood count with the same findings in the differential He was running a normal temperature no evidence of infection could be found no glandular enlargement and the spleen and liver were normal in size by examination and x ray Because of the high white count and the myelocytes we felt sure that he had myelogenous leukemia and was started on Fowler's solution with increasing doses While on this medication for one month his basal metabolism dropped to +13 weight increased to 145 pounds the pulse rate was 80 and the white blood count was 4400 and the patient admitted that he had not felt so well for the last five years At this time there were no clinical features

OPERATIVE INJURY TO THE RECURRENT LARYNGEAL NERVE

FRANK H. LAHEY

One of the very important anatomical structures which is involved in any operation upon the thyroid gland is the recurrent laryngeal nerve. This nerve is important because it controls the voice the most important factor concerned in our ability to express ourselves. It not only controls the voice but its double function of supplying the abductors and adductors of the larynx results in control of the glottic space and so the amount of air which can pass through the larynx an important feature during exertion when an increased amount of air must be taken in to meet the demands of increased effort.

The relation of the recurrent laryngeal nerve to the posterior aspect of the thyroid gland and to thyroid tumors makes it a structure which must always be under very accurate consideration and injury to which must always be guarded against in thyroid operations.

The recurrent laryngeal nerve is a peculiar structure in that there is contained in a single trunk two sets of fibers carrying impulses to two opposed sets of muscles one the muscles which spread the cord and widen the glottic space the abductors and the others which approximate the cords and narrow the glottic space the adductors. From reported experiments it is said that in the monkey the recurrent laryngeal nerve can be separated into its abductor and adductor set of fibers and that there are over twice as many fibers in the adductor portion of the nerve than in the abductor portion. It is said that if the nerve be separated into its two sets of fibers in the neck of an animal and placed on a cork stopper so that it is allowed to dry con-

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metabolism and glycosuria   It was only upon repeated blood studies which showed an increase in white blood count of 28 000 that the possibility of leukemia could account for the symptoms   It has been suggested that this patient may have gone through three distinct disease entities, *i e*, diabetes mellitus hyperthyroidism, and lastly leukemia   Case II was not so confusing although the presented signs and symptoms were that of hyperthyroidism *i e*, bilateral exophthalmos, weight loss small firm gland, elevated metabolism   The presence of minute hemorrhages in the fundi suggested some blood dyscrasia   but here again examination of the blood showed a normal white blood count of 10 000, and only upon repetition of this a few days later, was the true condition found

Conclusion —Two cases are presented with leukemia who presented signs and symptoms consistent with hyperthyroidism   It was only on routine blood examination that the true condition was suspected   Any case with an elevated metabolism with no definite cause should have repeated blood counts as the first indication of a relapse in leukemia may be a rise in the basal rate

ately after operation but with good ability to breathe and the cords are in the cadaveric position he should prepare the patient and himself for the possibility that there will be later glottic narrowing difficulty in breathing and that some operative procedure will be necessary to improve upon the diminished amount of airway in the larynx

During the course now of something over 10 000 thyroid operations we have at times seen respiratory difficulties amounting to real emergencies immediately following operation or at the time of operation It is conceivable that such an injury might take place in a recurrent laryngeal nerve that the abductor fibers of the nerve are injured but the adductor fibers not It is however hardly conceivable that such a delicate injury could occur in both nerves and only the abductor fibers on both sides be injured and the adductor fibers preserved thus producing narrowing of the glottic space and a respiratory obstruction amounting to an emergency

In our opinion based upon our operative experience most respiratory obstructions occurring at the time of operation or immediately following operation will not be due so much to recurrent laryngeal nerve injury as to angulation and pressure on the trachea as the result of the operative procedure When these respiratory obstructions do occur postoperatively the wound should immediately be opened the sutures in the muscles cut and the trachea inspected In the majority of cases it will be found that there is real angulation denting of the trachea and mechanical narrowing as the result of the operative procedure

The course of the recurrent laryngeal nerve is quite definite with its relation to the branches of the inferior thyroid artery running as it often does through the branches or just outside of the artery before it branches Its course in the groove between the esophagus and the trachea is quite definitely established It ascends beside the trachea to enter the larynx beneath the fibers of the inferior constrictors the lowest fibers of which are attached to the horn of the thyroid cartilage (Fig 298)

The horn of the thyroid cartilage which is opposite the upper

ductivity while driving is lost first in the abductor fibers and later in the adductor fibers. It is likewise stated that if the nerve be stimulated to exhaustion conductivity as a result of exhaustion stimulation occurs earlier in the abductor fibers than in the adductor fibers. This evidence would at least point to the suggestion that the adductor fibers are more resistant to injury than the abductor fibers.

The clinical history of patients with bilateral injury to the recurrent laryngeal nerve is often not understood and is as follows. With complete destruction of both recurrent laryngeal nerves there should be and usually is an immediate relaxation of both cords so that the cords are in what is termed the cadaveric position. This laxity of the cords results in an inability on the part of the patient to tense the cords and so an inability to make good vocal sounds. On the other hand because the cords permits of a sufficient airway because the glottic space is not narrowed and so there is no difficulty in breathing. Later due probably to an atrophy fibrosis not only in the cords but perhaps a fixation in the arytenoid cartilages this cadaveric laxity in the cords is taken up as they contract and the cords approach each other until there is a narrowed glottic space due to the fibrosis and contraction of the cords. This occurs some months after the original injury. At this time then there is a return of the voice since the cords are now tense as the result of the atrophy and fibrosis. Unfortunately at this time the patient complains of his inability to get sufficient air through particularly under exertion due to the narrowing of the glottic space caused by the fibrosed cords coming together.

The clinical course therefore of patients with bilateral abductor paralysis when the nerve is injured at the time of operation tends to be an immediate lack of voice following operation but good ability to breathe at the end of a few weeks or months a return of the voice which is very pleasing to the patient but a diminished ability to breathe. This is the clinical course of so many of these cases and a number of them who have been sent to the clinic have come giving this history. When therefore one sees a patient with complete loss of voice immedi-

as one wishes since the nerve there is beneath the fibers of the inferior constrictor (Fig 299)

We feel that many of the serious hemorrhages of thyroid operations arise from the terminal branches of the inferior thyroid artery where they ascend through the body of the gland beside the trachea at and about the level of the thyroid isthmus
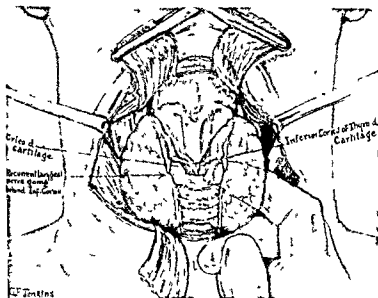

Fig 299—This illustrates by transparency the relation of the horn of the thyroid cartilage to the recurrent laryngeal nerve On the right the recurrent laryngeal nerve is shown by transparency through the gland disappearing beneath the fibers of the inferior constrictor to become intralaryngeal On the left the method of palpating the horn of the thyroid cartilage to locate the level at which the nerve becomes intralaryngeal

When an artery is cut here one tends to follow the vessel down beside the trachea until it has been clamped and tied and it is this procedure which not infrequently carries one to a greater depth along the course of the inferior thyroid artery than is realized This results occasionally, we believe in ligating the recurrent laryngeal nerve when the terminal branches of the

pole of the thyroid possesses *great anatomical value* as relates to thyroid operations since one can always palpate the horn of *the cartilage* and realize that opposite this point the nerve becomes intralaryngeal and *is protected above this point by the* overlying fibers of the inferior constrictors (Fig 299) We have, therefore found the horn of the thyroid cartilage to be a
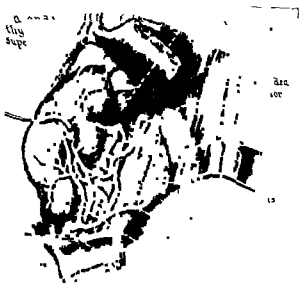

Fig 299 —Note the point where the recurrent laryngeal nerve is in re lation to the division of the inferior thyroid artery also where it d sappears under the lowest fibers of the inferior constrictor The gland has been turned forward abnormally to show the division of the inferior thyroid artery and the relation of the nerve to the artery as is p int of division It is not possi ble surgically to dislocate the gland to this extent so that the branches of the inferior thyroid artery are visualized as much as shown in this illustration

surgical landmark of considerable value When it is *necessary* to remove portions of the thyroid along the side of the larynx where the superior thyroid pole is attached to the larynx it has *proved* of comfort to us to palpate the horn of the thyroid cartilage and to realize that above the level of this point dissections can be carried as deeply along the side of the larynx

being included in ties on the terminal branches of the inferior thyroid artery (Fig 301)

The most serious dangers to the recurrent laryngeal nerve arise in those patients who have previously been operated by subtotal thyroidectomy It is in these cases that anatomic
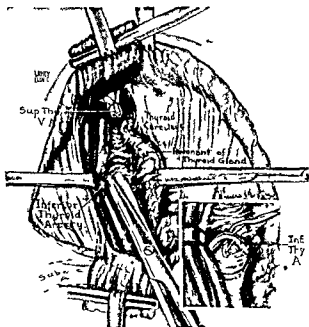

Fig 301   The same exposure with the gland turned forward and the artery shown between the posterior aspect of the gland and the large vessels In the insert the ligature sling passed around the main trunk of the inferior thyroid artery   Note that the artery is ligated external to its relation with the recurrent laryngeal nerve

distortion of the gland is present and not infrequently distortion of the course of the nerve   Likewise in large adenomata of the thyroid particularly when they are intrathoracic in location the course of the recurrent laryngeal nerve becomes distorted   In such cases wide incisions severing of the prethyroid

inferior thyroid artery are ligated within or through the posterior strip of thyroid tissue which is left behind to protect the nerve and the parathyroid body   We have found it much safer and certainly much easier to protect the recurrent laryngeal nerve in such cases to ligate the inferior thyroid artery as a trunk where it ascends from behind the common carotid artery
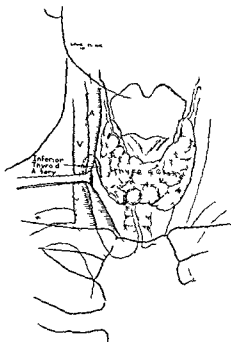

Fig 300—The method of retracting the internal jugular and common carotid artery and ligation of the inferior thyroid artery external to the gland   (Diagrammatic)

well external to the course of the recurrent laryngeal nerve (Fig 300)   Ligation of the inferior thyroid artery as a trunk behind the common carotid vessel is not difficult   It insures complete control of bleeding   It does not in our experience endanger the vascularization of the lower parathyroids and it definitely does protect recurrent laryngeal nerves from

muscles between clamps, accurate hemostasis and good exposure are very essential if one would avoid injuries to the recurrent laryngeal nerve

If one wishes to demonstrate the recurrent laryngeal nerve, there are two anatomical points at which it is most easily found One, the point close to the horn of the thyroid cartilage where the nerve disappears beneath the inferior fibers of the constrictor muscle and two, at the point where the inferior thyroid artery divides into its branches the nerve usually being in close relation to the branching portion of the artery, either running through the fibers or just outside of the primary divisions of the inferior thyroid artery (Fig 298)

A very important protective measure for all surgeons who are operating upon patients with recurrent hyperthyroidism is that of preoperative examination of the cords All patients who have had previous operation, should have their cords carefully examined and it should be noted whether or not there is paralysis of either or both of the cords whether or not there is any sluggishness of motion and this should be noted in the records so that the surgeon who does the second operation is not credited with a paralysis which resulted from the first operation Furthermore, all patients who have any interference with their voice whatever, should have preliminary examination of the cord For a considerable time it was the custom in this clinic to preoperatively examine the cords in all patients being operated on for thyroid disease This proved, however, such a burden and resulted in the discovery of cord defects in such a trivial percentage of cases when there was no evidence of injury such as a husky voice, that it did not prove feasible to continue with it

It is very desirable if one is operating upon a patient who has previously been operated upon, to realize if there be a paralysis of one vocal cord in order that extraordinary precaution may be taken to protect the other one and conservative sized remnants of thyroid surely left over the nerve on the remaining side in order that the very distressing postoperative condition of bilateral abductor paralysis does not occur